Coal Age

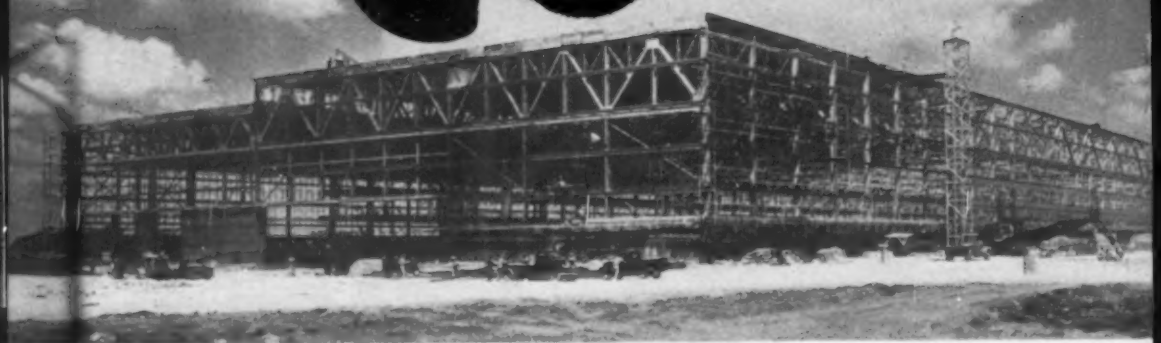
WHO MINES COAL AND WHERE p70

New Miner Mechanizes Pitching Longwalls
Automatic Fan Signals ● The Diesel Locomotive
Dense Media for Fines ● High-Tonnage Mining
Multiseam and 90-Ft Coal Stripping

Give enough!

HUNDREDS OF BRAND-NEW FACTORIES DEMAND

MORE COAL



WE BELIEVE you've only had a taste of what the defense effort is going to do to the demand for coal. Defense plants are springing up in every section of the country... hundreds of established plants are being expanded. In the near future you should see a rise in the need for coal such as you have never seen before—and it's due to continue rising for a long time to come!

All of this makes now — *today* — a good time to re-evaluate your coal hauling system. Will it carry far greater tonnages without fear of failure? Is your equipment modern and flexible enough to fit into a long expansion program? If there is any doubt, consider constant haulage mine cars—*the haulage system that never stops your whole transportation system for repairs.* Your A.C.F. Sales Representative has the facts—call him in. American Car and Foundry Company, New York • Chicago • St. Louis • Cleveland Philadelphia • Huntington, W. Va. • San Francisco Washington • Berwick, Pa.

a.C.f. MINE CARS

for Constant Haulage

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER

Photo courtesy Harding-Jones Paper Co., South Kinsville, Ohio

Drive headache cured with B. F. Goodrich grommet belts

B. F. Goodrich grommet V belts cut costs 20 to 50%

HERE was one of the biggest drive problems in this plant. The machine shown in the picture runs 24 hours a day, 7 days a week. Belts previously used couldn't handle the job. Motor bearings were burning out, belts were snapping under the shock load.

Then a B. F. Goodrich distributor suggested grommet belts to stand the jerks and hard pulls. Installed nine months ago, B. F. Goodrich grommet belts are still going strong, and look good for many more months of use. Here's why BFG grommet belts give longer service, save maintenance costs:

Endless — A grommet is endless, made by winding heavy cord on itself to form an endless loop. It has no overlapping cord sections. Because most of the failures in ordinary V belts occur in the region where cords overlap, the endless grommet belt eliminates such failures.

Concentrated cord strength — All of the cord material in a B. F. Goodrich grommet belt is *concentrated* in twin grommets, positioned close to the driving faces of the pulley. No layers of cords to rub against one another and generate heat; cord and adhesion failures are reduced.

Better grip, less slip — Because a grommet is endless, a grommet belt is more flexible, grips the pulleys better. Size for size, grommet belts will give ⅓ more gripping power, pull heavier loads with a higher safety factor.

Only B. F. Goodrich makes the grommet! — No other multiple-V belt is a grommet belt (U. S. Patent No. 2,233,294). Now available in C, D and E sections. See your local B. F. Goodrich distributor. Ask him to show you his "X-ray" belt that illustrates grommet construction clearly. *The B.F.Goodrich Company, Industrial & General Products Division, Akron, Ohio.*

Grommet Belts BY

B.F.Goodrich

RUBBER FOR INDUSTRY

The Champion

IN A CLASS BY HIMSELF

Remember? It happened in 1948. CITATION, the wonder horse, came in first in 25 out of 27 starts, including racing's TRIPLE CROWN . . . the KENTUCKY DERBY, PREAKNESS and BELMONT STAKES. In the PIMLICO SPECIAL no other horse was even conceded a chance. So CITATION was the only entry; and for the first time in racing history a horse galloped around the track ALONE, the undisputed CHAMPION!

HULBURT OIL & GREASE COMPANY, PHILADELPHIA, PA.

Specialists in Coal Mine Lubrication

The Champion

...IN COAL MINE LUBRICATION

Hulburt Quality GREASE

"The Champion"

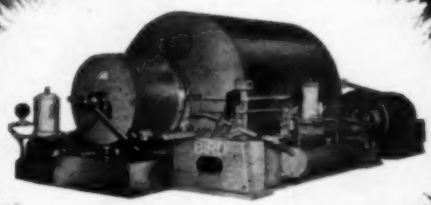
To say that HULBURT QUALITY Grease is in a class by itself when it comes to lubricating coal mine machinery is only stating a fact. One reason is, this Grease is made to do just this one thing, and does it supremely well! Don't gamble ten horses or grease, either. Just enter Hulburt Grease in any coal mine, and friction wouldn't be conceded a chance to go on causing its usual troubles! Yes—Hulburt takes the "Triple Crown" in coal mines—Lower Maintenance, Continuous Operation, and Greater Production from coal mining machinery.

TWENTY MILLION TONS OF FINE COAL

Have Been Dewatered By

BIRD COAL FILTERS

WITHOUT ONE SINGLE MINUTE OF LOST OPERATING TIME DUE TO MECHANICAL FAILURE!



Down time for routine maintenance has in every instance taken place during planned maintenance periods, and these are *months,* not days, apart.

Maintenance cost averages less than 2 cents a ton, often less than 1 cent.

Overall operating cost is something like *five cents per ton*—far, far less than that of any other equipment for the purpose.

BIRD MACHINE COMPANY

SOUTH WALPOLE • MASSACHUSETTS

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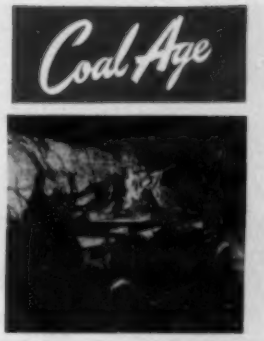

THIS MONTH'S COVER

THIS NEW ALL-HYDRAULIC DRILL is an example of the modern mechanical equipment used by The Coalcreek Coal Co., where 14 men produce and prepare an average of 800 tons daily (see p 106). If mechanical mining is your forte, also be sure to read the description of the new Dosco continuous miner that is successfully working a 17½-deg seam (p 82) and the story of the development of the first permissible diesel locomotive (p 98). Both units promise considerable impact on present-day mining methods.

COMING IN NOVEMBER

New Transport for Coal?—What it costs to move coal's energy to the consumer and what the industry can do about it.

Non-Stop Face Haulage, with span-type conveyors linking loaders and room conveyors, adds 10 tons per man-shift at Leckie Collieries mine.

How Northern Illinois Moved a big shovel 10 mi crosscountry and what it did to handle the seven major obstacles encountered.

Aluminum Cars and Diesels Underground— Dominion Coal's installation proves self after 4-yr testing.

Making Service Pay—Tightening service added 90 tons per mining unit in the first month at the King Mine of the U. S. Fuel Co.

How to Cash in on Your Sludge Pond—With only five men, United Electric's Fidelity mine recovers 40 tph of marketable coal.

COAL AGE VOLUME 56 OCTOBER, 1951 NUMBER 10
(with which are combined The Colliery Engineer and Mines and Minerals)

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time and station.

TEXACO

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. . . lower maintenance costs.

Let a Texaco Lubrication Engineer work with you to reduce costs throughout your mine. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

☆ ☆ ☆

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

Photo courtesy Westinghouse Electric Corporation

For the Coal Mining Industry

Here's Tournadozer "time-table"

- Runs .3 to 1.3 miles between jobs
- Cleans up around 2 shovels
- Maintains 2 dumps
- Levels site for washing plant
- Clears truck turn-around areas
- Tows mine equipment

. . . all in typical 8-hour shift!

This iron mine on the Mesabi Range near Hibbing, Minnesota, has a lot of clean-up jobs widely scattered over the large pit area, on dumps and along the haul roads. Duration of each job is short . . . usually 10 to 40 minutes working time. Travel distance between jobs varies anywhere from .3 to 1.3 miles. Operating on a fast "work-and-run" schedule, a LeTourneau 19 m.p.h. Tournadozer alternates between 2 stripping shovels and 2 dump areas . . . cleans up spillage, clears truck approaches at the shovels, keeps the dumps leveled. While traveling between jobs, the rubber-tired Tournadozer finds time to clear truck turn-around areas along the haul roads, level a washing plant site, tow shacks, move blasting equipment and handle other odd jobs . . . all in a typical 8-hour shift.

In addition to its fast, "run-about" ability, C Tournadozer has many speed advantages that reduce job time. 19 m.p.h. forward, and 8 m.p.h. reverse speeds, plus 186 h.p., 4-wheel traction, give fast dozing cycles. Instant gear changes with constant-mesh transmission, plus torque converter (optional), and easy electric controls, all add up to more work done with Tournadozer. Your LeTourneau Distributor has more information that will show you how to cut time and costs on your dozer jobs. See him soon.

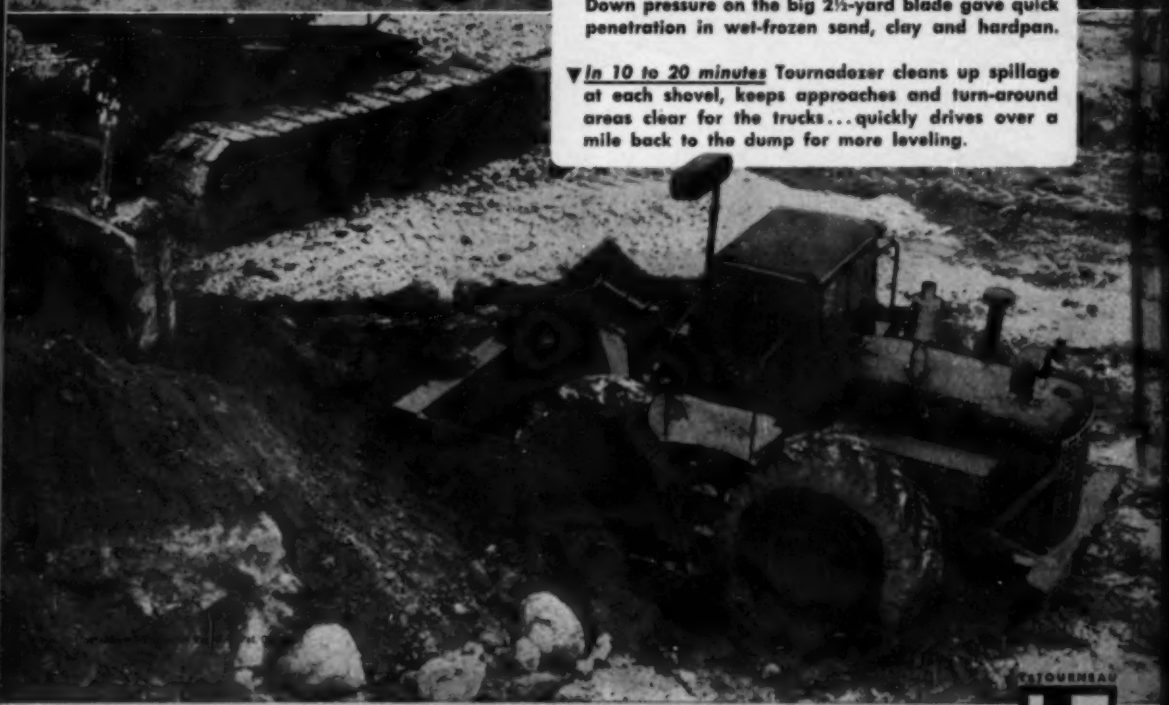
To prepare for blasting, Tournadozer easily towed shack up 1/10 mile of snow-covered 10% grade . . . pulled cable boat, and helped move shovel and other equipment away from the blast area.

LETOURNEAU PEORIA, ILLINOIS — JOB-PROVED The World Over — TOURNADOZERS

on Mesabi Iron Range

▲ *Several times a day* Tournadozer runs to one of the dump areas, works 30 to 40 minutes leveling, dozing spoil over the bank. At time photos were taken, Tournadozer was operating in zero temperatures. Down pressure on the big 2½-yard blade gave quick penetration in wet-frozen sand, clay and hardpan.

▼ *In 10 to 20 minutes* Tournadozer cleans up spillage at each shovel, keeps approaches and turn-around areas clear for the trucks... quickly drives over a mile back to the dump for more leveling.

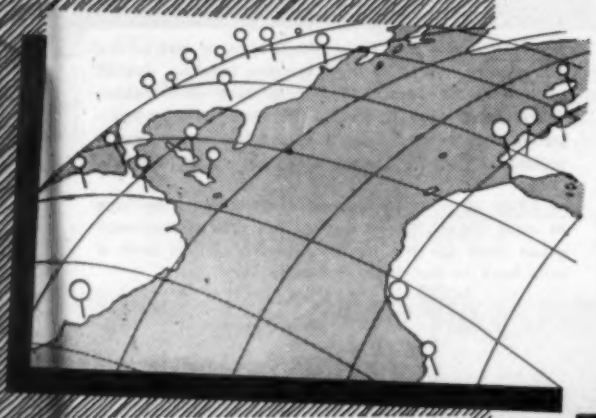


IT'S RUBBER THAT PUTS THE ACTION IN TRACTION

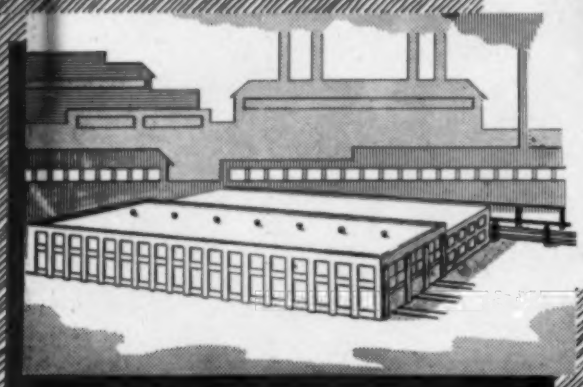
R.G. LeTOURNEAU
LET
EQUIPMENT

Dewatering of Fine Coal Pays Dividends

Eimco filtration engineers are available to help in the planning and installation of filtration equipment.



A complete, world-wide service and sales organization, manned by trained technical personnel.

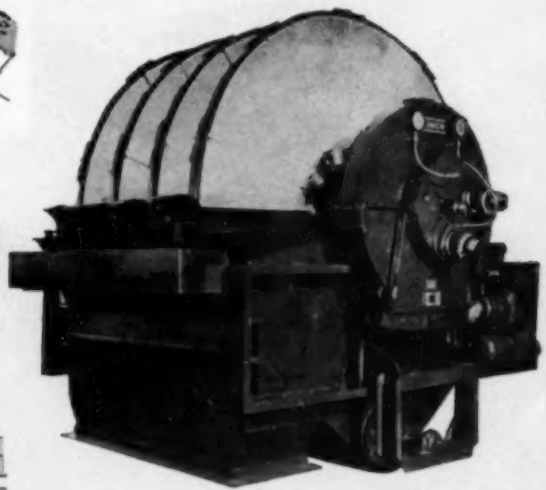


Complete manufacturing facilities include: iron and steel foundries, steel fabricating shops, machine shops and assembly shops covering approximately half a million square feet of floor space.

Eimco Vacuum Filters for dewatering coal fines are backed by more than half a century of experience in serving the mining and process industries through the sale and service of heavy-duty machinery. Your Eimco filter is the product of many years of research in many different process industries. In each industry, the success of the EIMCO filters has added to the wealth of experience that makes your EIMCO the outstanding, heavy-duty, trouble-free machine that it is today.

Complete manufacturing facilities at EIMCO provide for the control of all castings and weldments used in the manufacture of EIMCO equipment. Well equipped dealers and service organizations assure the customer of immediate attention on operating problems. EIMCO's fully equipped laboratory, is available to answer customers filtration problems. Write for information on the shipment of samples.

An EIMCO 8' diameter by 4 disc type "AGIDISC" filter specially designed for the dewatering of fine coal. The AGIDISC assures even distribution and drying of the coal fines as well as greater tonnages at lower moisture content.



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Besides the illustrations and descriptions of cables, the catalog gives information on splicing and on cable selection.

Want one? We will gladly send it. Simply fill in the coupon and return it to us.

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MUSCLE MEN
of the Mines...

AIRDOX

Let One of Them Show How NON-EXPLOSIVE MINING Will Pay in Your Mine

Either of these outstanding Non-Explosive Mining Methods will bring a whole string of advantages to your mine—Airdox or Cardox. Both are ready to cut operating costs by applying the non-shattering force of compressed air (Airdox) or expanding carbon dioxide (Cardox) at the *back*

CARDOX-HARDSOCG AUGER MINER

Drive unit and Cardox-Hardsocg Augers salvage countless tons where over-burden became too costly to remove and further stripping was halted. Augers 20 to 40 inches in diameter draw the coal in a continuous flow from the seam. See in the picture how addition of a portable conveyor makes this a continuous operation, loading into trucks or cars automatically.

CARDOX

of a simple drill hole. This kind of shot will heave out the coal by irresistible power without the violent impact of explosives.

Add up the advantages: Increase in sales realization . . . Preservation of roof structure . . . Increase in loading efficiency at working face... Reduction of maintenance on loading equipment . . . Elimination of fines with resulting reduction in cleaning costs . . . Achievement of new safety —in working conditions which permits on-shift shooting in many mines—in coal handling all the way to the plant by elimination of the hazard of detonator caps lost in the coal.

AIRDOX or CARDOX? Which? There will be some edge of one over the other depending on conditions at each mine. The choice is a technical decision between our engineers and yours. Write and get the facts on both methods.

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Cardox-Hardsocg Cutterheads are available with replacement bits ranging from 2½ inches to 3 inches in diameter.

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The Non-Explosive Mining Method

CARDOX CORPORATION

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Rope leads from

UPSON-WALTON

How to lubricate wire rope

Each wire in a rope is a "live wire"—since it moves with respect to its neighboring wires every time the rope bends or flexes. This causes wear, which can be reduced by proper lubrication.

In an Upson-Walton rope every wire is lubricated as it is stranded—thus lubrication is built in. However, for long life this lubrication should be repeated periodically. Use a lubricant which:

- is commercially chemically neutral.
- can penetrate between the wires and strands and to the core of the rope.
- is adhesive enough not to be thrown off by vibration.
- will not either harden or soften under extremes in temperatures.

With proper care Upson-Walton wire rope will give you longer life, greater safety and greater economy. Use of the best materials and methods, and thorough testing are your assurance of quality. Specify Upson-Walton on your next job.

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wire rope • rope fittings
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MATCH YOUR WIRE ROPE TO YOUR FITTINGS AND BLOCKS . . . ONLY UPSON WALTON OFFERS ALL THREE

She's coming down the mountain

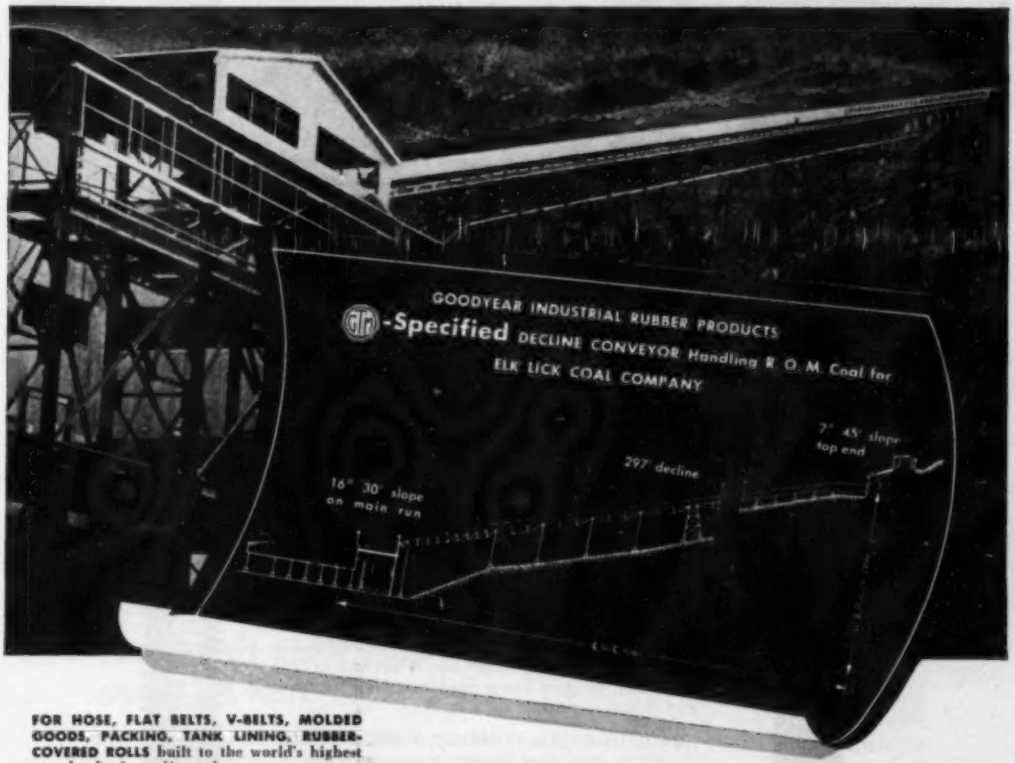
Faster–Safer–at Lower Cost Per Ton

IN the Jerryville, West Virginia operation of The Elk Lick Coal Company, the mine entry is on a hillside 297 feet above the tipple. Coal was brought down by a slow, inefficient, dangerous rail system running on an 8% grade—a carrier that fell far short of handling the mine's production.

Seeking to speed up deliveries, the mine considered every form of transport, including aerial trams, and finally called in the G.T.M.—Goodyear Technical Man—to design a decline conveyor.

Installed six years ago, this conveyor operates on a 16° 30′ slope, in a direct line between entry and tipple—cutting haulage distance to a minimum, handling the entire output more economically and with greater safety.

Downhill, as here—or up, with single flight lifts as high as 1500′—above ground or below, the G.T.M. can help you cut haulage costs. Ask him for dollars-and-cents proof established in hundreds of mining operations, or write Goodyear, Akron 16, Ohio.


GOODYEAR INDUSTRIAL RUBBER PRODUCTS
-Specified DECLINE CONVEYOR Handling R. O. M. Coal for
ELK LICK COAL COMPANY
16° 30′ slope on main run
297′ decline
7° 45′ slope top end

FOR HOSE, FLAT BELTS, V-BELTS, MOLDED GOODS, PACKING, TANK LINING, RUBBER-COVERED ROLLS built to the world's highest standard of quality, phone your nearest Goodyear Industrial Rubber Products Distributor.

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GOODYEAR

THE GREATEST NAME IN RUBBER

These Bolts Provide MAXIMUM Roof Protection

You know from past experience how important it is to have tight, sound roofs throughout the mine. Such roofs mean fewer accidents, additional safety for miners, lower operating costs.

To enable operators to obtain this ideal roof condition, Bethlehem has developed the two roof bolts shown here. The bolts are made of new-billet steel, in lengths to meet individual requirements. Either bolt can be used vertically, or at 45- or 60-deg. angles. And either bolt can be used with roof ties, roof channels, roof plates, plate washers, and angle washers. For details, write to us at Bethlehem, Pa.

BETHLEHEM SQUARE HEAD ROOF BOLT WITH EXPANSION SLEEVE

Assembly consists of special ¾-in. rolled-thread bolt and expansion sleeve. Special unchamfered square head provides greater wrenching surfaces. Forged washer under head for additional bearing surface. When assembled and tightened, bolt is engaged by a forged-steel tapered plug, bearing against corresponding flat surfaces on the inner sides of the expansion shell. Two pressed ears on the bolt support expansion sleeve while anchoring.

BETHLEHEM SLOTTED ROOF BOLT

(Forged Slots Are Uniformly Centered)

The end of bolt has a 6-in. slot made by an exclusive forging process. Slotted end is equivalent to two half-rounds, and accommodates a wedge. Opposite end of bolt has 5 in. of 1-in. rolled thread. Usually furnished with regular square nut. When back of hole is reached, wedge is forced deep into slot, expanding end of bolt to provide tight fit.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation.

BETHLEHEM STEEL

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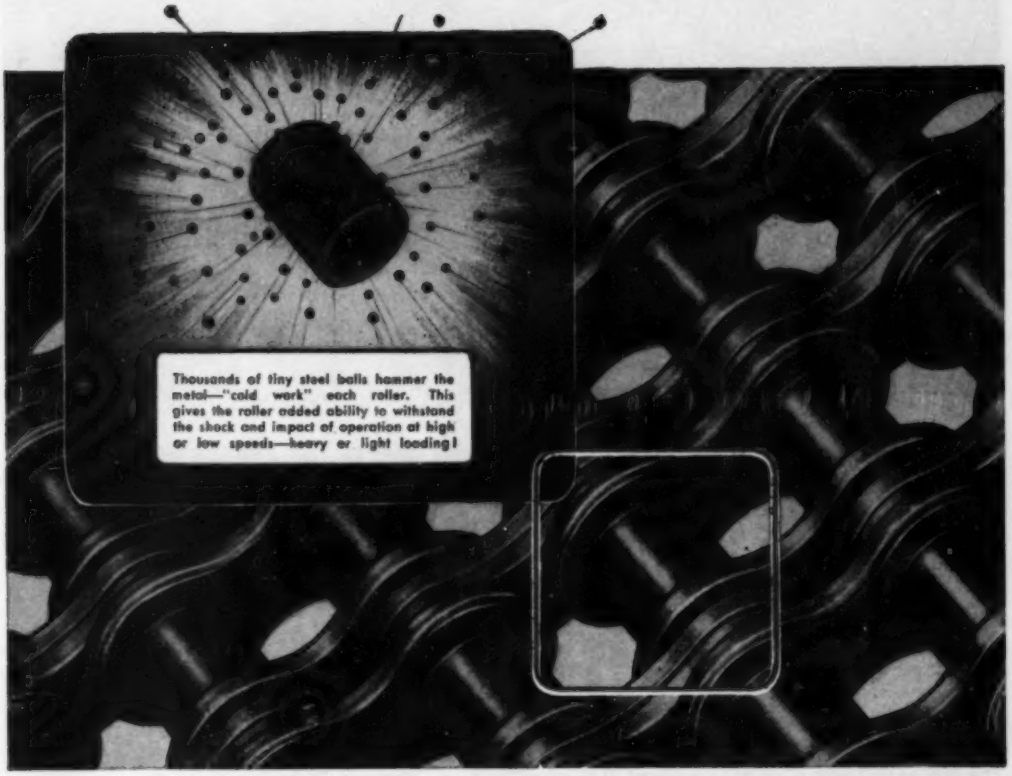
Get the ROLLER chain with rollers that are

SHOT PEENED

for EXTRA fatigue life!


Thousands of tiny steel balls hammer the metal—"cold work" each roller. This gives the roller added ability to withstand the shock and impact of operation at high or low speeds—heavy or light loading!

You get this added feature in every LINK-BELT Roller Chain

You get absolute uniformity, too. No highs. No lows. Just smooth, flowing dependable chains that pay off in wide flexibility—greater performance—longer life.

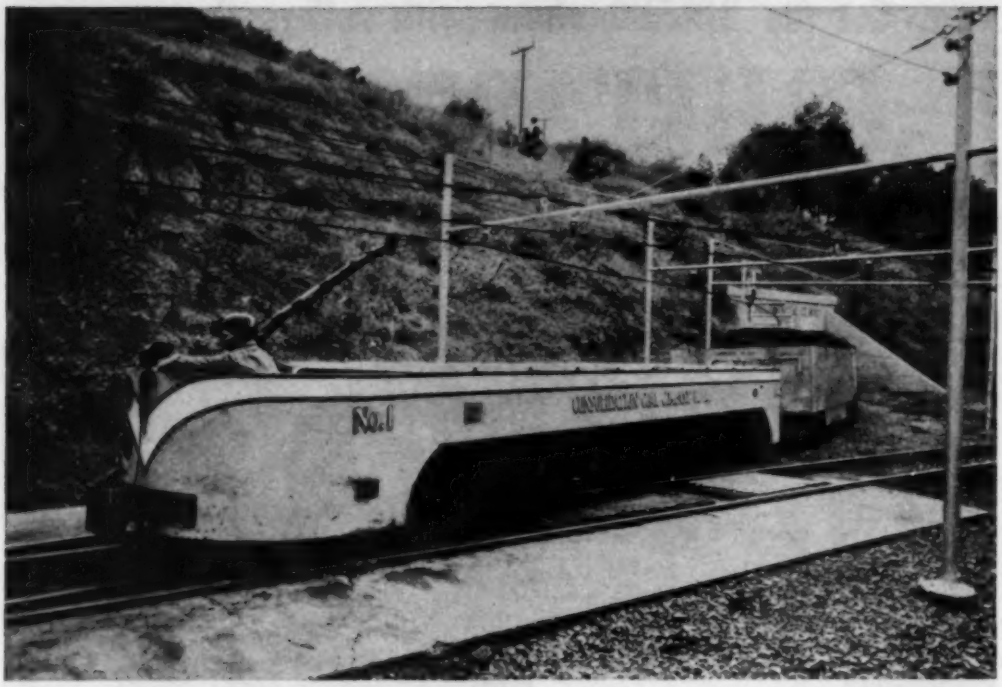
LINK-BELT Roller Chains are made from carefully selected materials with controlled heat treatment to assure uniformity and absence of weak members, then—rollers are shot peened to give them the extra fatigue life needed for today's higher speeds and heavier loads.

Link-Belt Roller Chain is available in single or multiple widths, in ⅜" to 3" pitch and double pitch. If you have a roller chain problem, see the LINK-BELT engineer nearest you.

LINK-BELT

ROLLER CHAINS and SPROCKETS

LINK-BELT COMPANY, Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Johannesburg. Offices, Factory Branch Stores and Distributors in principal cities. 12.207



G-E MINE LOCOMOTIVES

get more coal out faster and

STAY ON THE JOB

The top availability of sturdy, powerful G-E mine locomotives means that you can depend on them to bring the coal out—day after day, load after load. G-E locomotives are built for the job and stay on the job because their rugged, carefully engineered construction gives them staying power and requires little maintenance.

Long intervals between overhauls cut down operating expense. There are fewer parts which need regular maintenance and these can be serviced quickly and easily. Equalized spring suspension lessens track wear. Balanced design enables G-E locomotives to hug the rails at top speed. Smooth pickup permits operation close to the slippage point, increasing the load that can be started.

High availability, low maintenance costs, greater protection for the operator mean that G-E locomotives can do your hauling job better. Call your G-E representative. He'll show you how the right General Electric mine locomotives will do your job with savings in cost and time. General Electric Company, Schenectady 5, N. Y.

GENERAL ELECTRIC

120-54

Save time on Pesky Jobs

with the 18-pound

Le Roi-CLEVELAND Hornet Rock Drill

...and your miners can put more work on production

The H-22 Hornet is a terrific little rock drill. It weighs only 18 lbs., but it has all the design features found in larger Le Roi-CLEVELAND machines. That is why, pound for pound, you can't beat it for drilling speed.

And here's what your miners can do with it—easily and quickly, without strain: Drill holes for trolley hanger bolts. Clean up roof. Clear out rock falls. Brush bottom. Drill oversize pieces at the grizzly. Cut hitches. And a thousand and one other odd jobs.

Because the H-22 Hornet is so light, and drills so fast for its weight, your miners get these tasks done in a hurry — more time can be spent on production; your costs look better. So equip your miners with Le-Roi CLEVELAND Hornets. Complete information is available — just write for it.

H-22 HORNET FEATURES

- Weight — 18 lbs.
- Powerful blowing
- Strong rotation — easy holding
- Both wet and dry types
- Conventional rifle-bar rotation (3 pawls)
- Replaceable spacer bushing
- Spade or Tee handle
- 2-piece chuck and rotating sleeve
- Lubrication pocket in handle
- Chuck size ⅞" hex x 3¼" — adapters too
- Drop forgings for major parts

LE ROI COMPANY

CLEVELAND ROCK DRILL DIVISION

12500 Berea Road, Cleveland 11, Ohio

Plants: Milwaukee • Cleveland • Greenwich, Ohio

HUBBARD MINE ROOF BOLTS

WEDGE-NUT STYLE

Easier to install...
More head room...
Greater safety...

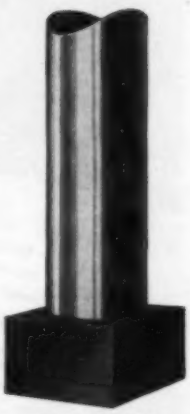
Exhaustive tests have proven that Hubbard Mine Roof Bolts meet all requirements for mines where roof bolting is practical.

The Hubbard Wedge-Nut Style Mine Roof Bolt is easily installed without the use of special equipment. The full square head, without chamfering, eliminates slipping of wrenches, saves time.

The only head room required for the Hubbard Mine Roof Bolt is the thickness of the bolt head plus the plate. Freedom of movement, for men and equipment, improves working conditions, increases output.

The design of the Hubbard Mine Roof Bolt is simple and fool proof. The wedge-nut consists of two diagonally separated sections. As the bolt is tightened the two sections move one against the other with a wedging action, spreading both parts against the walls of the hole. The wedge so formed takes a biting grip *over its entire length* that holds for keeps.

Hubbard Mine Roof Bolts are ¾-inch diameter. They are furnished in any desired length. Usual installation practice employs plate washers 6-inches or more square (not included). Write for additional details.



Patents Applied For

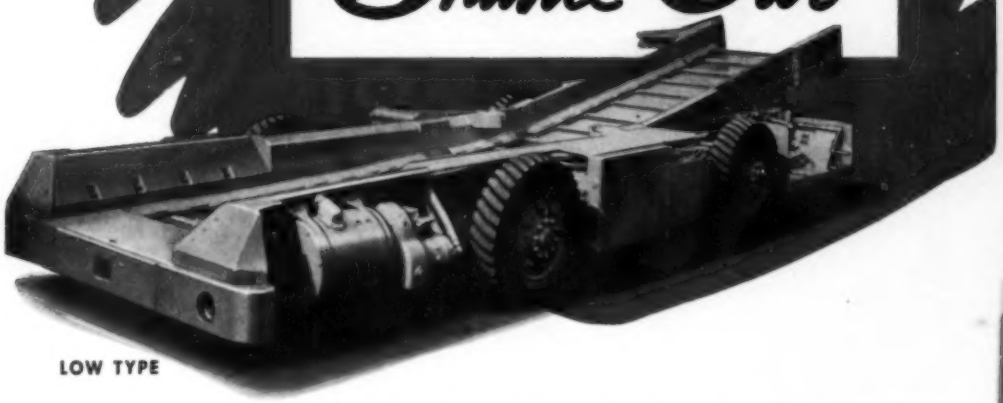
HUBBARD AND COMPANY

ESTABLISHED 1842

HUNTINGTON, W. VA. • PITTSBURGH • CHICAGO • OAKLAND, CALIF.

"Have the Load on Hubbard Hardware!"

A new JEFFREY Shuttle Car



LOW TYPE

CLASS 66

Pooling brains and ingenuity with long experience in designing, developing and building a wide range of mining equipment, Jeffrey offers one of its latest units . . . the Class 66 Shuttle Car. Both the low and the high types are shown on this page.

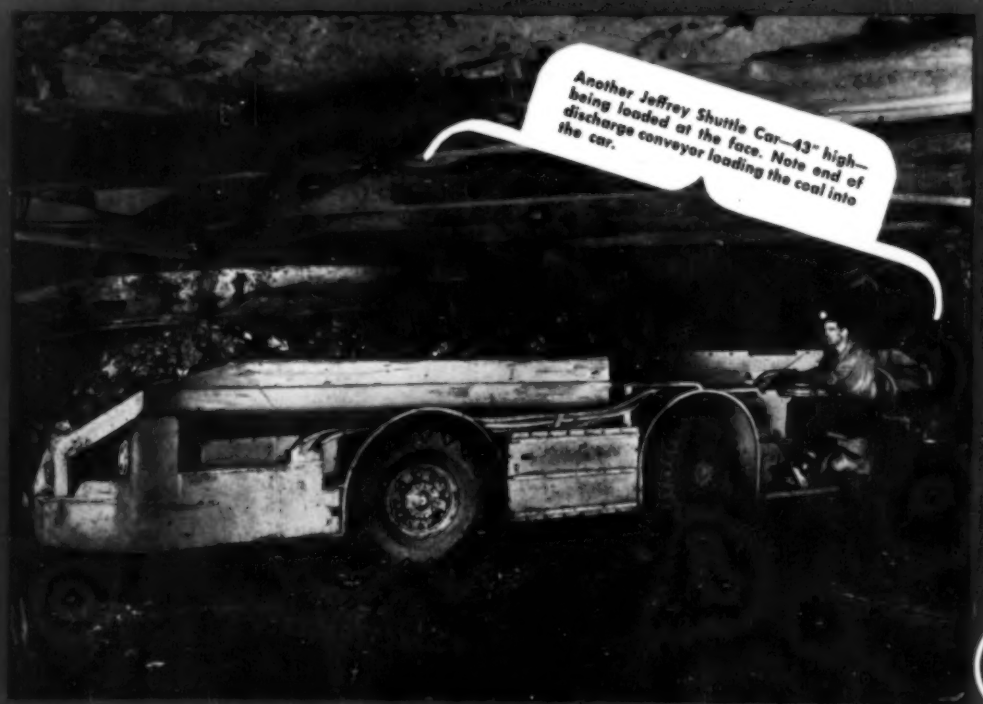
This model features an elevating front section permitting coal to be discharged directly into mine cars or lowered for discharge into main haulage conveyors. Other points include:

NEW Chassis type body design—rigid construction
Airplane Disc-type 4-wheel Hydraulic Brakes
Hydraulically-driven Variable-speed Conveyor
Hydraulically-driven Cable Reel
Improved Hydraulic Booster Steering
All equipment mounted to improve maintenance

The added flexibility these modern Shuttle Cars give your operation plus the high production and low cost per ton they afford is worth considering. Send for our new Catalog No. 840.

HIGH TYPE

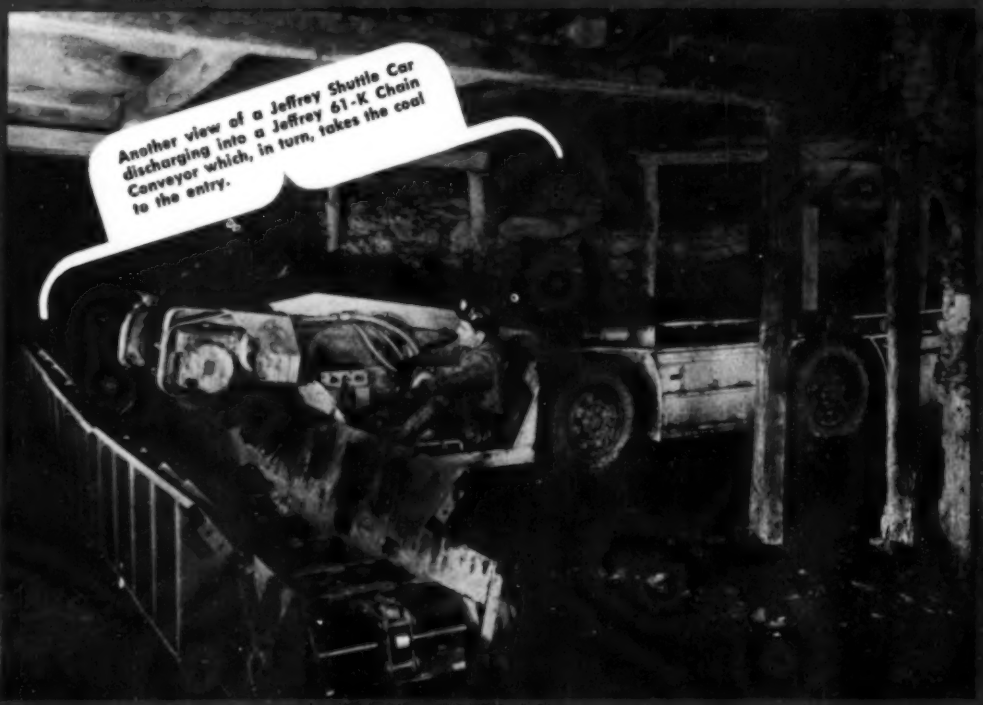
Here you see one of the Jeffrey Shuttle Cars being loaded with a Jeffrey Loading Machine. It is only 30" high. Loading at the face is easy with such a combination.



Another Jeffrey Shuttle Car—43" high—being loaded at the face. Note end of discharge conveyor loading the coal into the car.

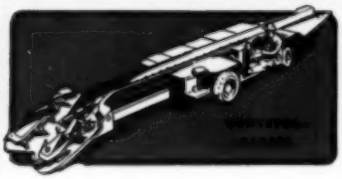
WHEREVER COAL IS MINED YOU

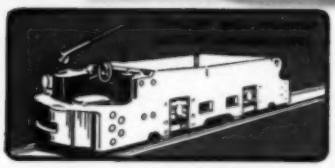
Jeffrey Shuttle Car taking a load of coal from the face back to the mine cars in the entry. Note the low height of this car. This installation is in Kentucky.



Another view of a Jeffrey Shuttle Car discharging into a Jeffrey 61-K Chain Conveyor which, in turn, takes the coal to the entry.

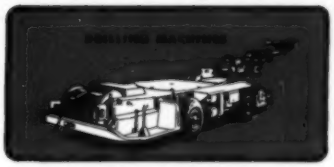
U'LL FIND *JEFFREY* EQUIPMENT

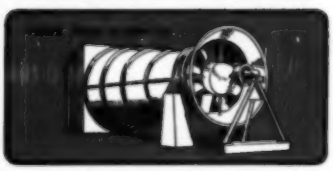


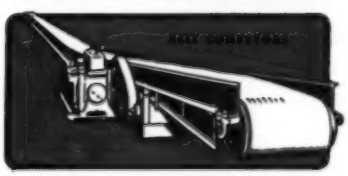


JEFFREY

EQUIPMENT FOR COAL MINES







THE JEFFREY MANUFACTURING COMPANY

Established 1877

General and Export Sales Offices

COLUMBUS 16, OHIO, U. S. A.

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JEFFREY-GALION (PTY.) LTD., Johannesburg, S. A.
GALION (GREAT BRITAIN) LTD., Wakefield, England
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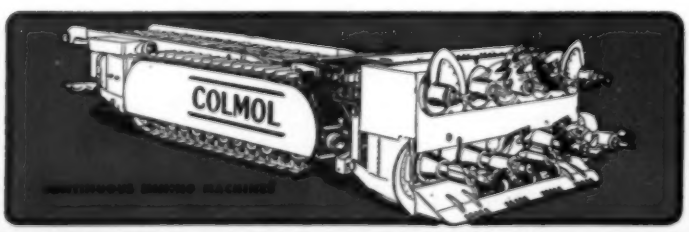
THE GALION IRON WORKS & MFG. CO., Galion and Bucyrus, Ohio

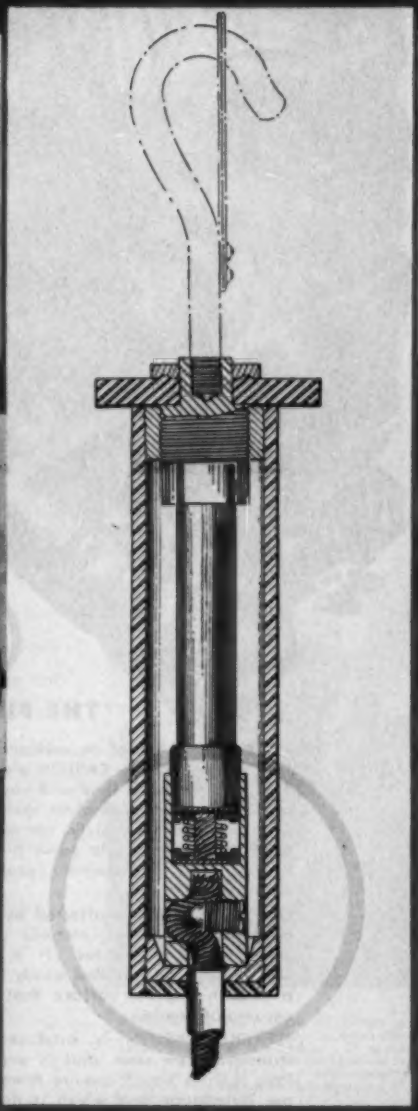


Eliminate Cable Pull-Out!

The MMP-Jabco Trolley Tap is anchored to the lower socket by a jaw-action screw. Full pressure contact is provided at *three* points.

This method is used also in MMP-Jabco Cable Connectors, Junior Taps, Fuseless Taps and Ground Clamps.

Rubber hand guard for safety . . . Micarta tube assembly for maximum strength . . . Shunted spring allows for discrepancies in fuse lengths.



MMP JABCO

FUSELESS TAPS

Ideal for making safe, fast, A.C. and, insulated ground connection to cable, when used with MMP-Jabco hook clamp.

Used for frame grounding or any connection where a fuse is not required.

MMP JABCO

TROLLEY TAP

Trolley Tap with self-adjusting Hook Clamp is a snap—stays put—eliminates arcing—improves current conditions.

To Help You Order:

ITEM	PART NO.
Trolley Tap	J-100
Hook Clamp	J-50
Trolley Tap With Plain Hook	AJ-175
Fuseless Taps	J-200

MMP-Jabco—A Complete Line Of Improved Equipment For More Efficient Mine Operation

Write for Catalog No. 551

MINING MACHINE PARTS, INC.

5702 ST. CLAIR AVENUE • CLEVELAND 3, OHIO

Only Carlon

THE FIRST REAL PIPE THAT IS PLASTIC!

● FOR YEARS of dependable trouble-free service, specify CARLON plastic pipe. This new means of fluid and vapor transmission combines absolute resistance to rot, rust and electrolytic corrosion with ease of installation to solve pipe maintenance and replacement problems in mines of all types.

ONLY CARLON is unaffected by sulphurous waters, alkalies, metallic salts and other corrosive wastes. It is light in weight, can be handled easily, and has a smooth internal surface that will not accumulate scale.

FLEXIBLE CARLON is produced in all standard pipe sizes and is supplied in long lengths which require fewer fittings per installation and which conform to irregular surface contours as well as slope or entry direction.

A complete line of molded plastic fittings incorporating standard I.P.T. is available for plastic-to-plastic or plastic-to-metal connections.

To obtain the most durable mine pipe available today, specify ONLY CARLON.

At present, raw material shortages are limiting the production of certain types of CARLON pipe. Every effort is being made to overcome this problem and to meet the demand for CARLON . . . the first real pipe that is plastic.

CARLON CP 201-CP

CARLON PRODUCTS CORPORATION

IN CANADA: MICRO PLASTICS, LTD., ACTON, ONT.

10462 MEECH AVE. • CLEVELAND 5, OHIO

Protect bucket lips, teeth, bucket sides and bottom with Stoody Self-Hardening 21! A few stringer beads as cross-hatches do the trick on large areas. Combine stringers and solid deposits at concentrated wear points.

Stoody Self-Hardening 21 provides excellent wear resistance, goes on fast and easy and makes heavy deposits in one pass. For these reasons *and because it's economically priced,* Stoody Self-Hardening 21 is the ideal rod for heavy-impact, severe-abrasion.

See your Stoody Dealer—600 in the U. S. and Canada—or write for complete welding procedures.

STOODY COMPANY

11943 E. SLAUSON AVENUE, WHITTIER, CALIFORNIA

APPLICATION: Apply Stoody Self-Hardening 21 to dipper teeth on all sides 2" up from point. Extend stringers of Self-Hardening 21 up the balance of each tooth. Where abrasion is unusually severe but impact only moderate substitute Tube Berium for Self-Hardening 21 deposits on the point.

STOODY SELF-HARDENING 21

LONG *PIGGYBACK* CONTINUOUS HAULAGE MINING INCREASES ...with

WISHBONE PIVOT
PIGGYBACK CONVEYOR"—equipped with extra strong "Superflite" conveyor chain of balanced strength design and "whispering joint" pans.
DISCHARGE END—firmly mounted on dolly which rides freely back and forth atop flanged edges of Long Chain Room Conveyor.
LONG CONVERSION BOOM FOR LOADER —connects directly to the receiving end of the Piggyback, which it lifts and carries along with the loading machine automatically.
WISHBONE PIVOT
LOADING MACHINE—Any standard type is adaptable to the Piggyback System, which permits 180° pivot of loader.
Receiving End
Discharge End
LONG ROOM CONVEYOR—Long 400-R, capacity to 2½ tons per minute; or Long 400-WT-15, capacity of 4½ tons per minute.
WISHBONE PIVOTS—each provides up to 180° pivot-action operation, with the load automatically centered at all times.

All standard type loading machines and continuous miners are adaptable to the Piggyback System

**Patented and patents pending*

LET'S LOOK AT THE RECORD!

"6 hours and 56 minutes actual loading machine operation time in an 8-hour shift time study."

Superintendent

"Addition of Piggybacks to existing loaders and conveyors increased production 300 tons per day."

General Manager

"The result (of Piggyback installation) was an immediate increase from 10 to 20 tons per man day."

Editorial Comment

"40 tons per man-shift in 34" coal with Piggyback-860 loader combination."

Assistant to President

"Loading time peaks of 85% have been hit. Peak production per man shift has been 53 tons."

Vice President in Charge of Operations

"The Piggyback conveyor impresses my firm as being the forerunner of a new method of mining."

Prominent Consulting Engineer

Under any mechanical loading conditions, you're assured increased efficiency with .....

PRODUCTION any loader!

The portable Piggyback—the first and only bridge conveyor—offers a practical, economical solution to the problem of *true continuous mining* . . . provides the vital link that completes the continuous haulage system from loader to tipple . . . eliminates costly "downtime" waiting for intermediate transportation.

Actual performance under a wide range of operating conditions has already proved the Piggyback* Continuous Haulage System to be the most efficient ever developed for moving coal from the face to the entry.

Operating as the connecting link between the mobile loader and Room Conveyor, the Piggyback takes coal out in a continuous, steady stream *as fast as it is produced.* There's no waiting for intermittent transportation. The receiving end of the Piggyback Conveyor is attached directly to the loading machine and follows it automatically as it moves.

In use, the loader-Piggyback-Long Room Conveyor combination operates as a single machine without any attention whatsoever from the operator. Consequently, he can devote his entire time and energy to operation of the loader. He never has to even look back at the rear conveyor discharge. Further, he never has to tram coal on the loader or stop for pan-ups.

Of particular note is the flexibility and extreme maneuverability of the Piggyback. The two "Wishbone" pivots—one at each end of the Piggyback—provide a pivot action of 180° each. This means the load is centered at all times and continuous haulage can be maintained at a 90° angle breakthrough and in close quarters. The dolly action permits long advances without pan-ups.

Available in two models with rated capacities from 2 to 5 tons per minute, the Piggyback System can be used with any standard loading machine. Write today for complete details!

Ask for a demonstration—no obligation!

LONG Super Mine Car Co., Inc.
FAYETTEVILLE, W. VA. • OAK HILL, W. VA.

LONG
PIGGYBACK®
CONTINUOUS HAULAGE MINING

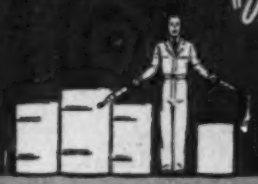
Piggyback with 8 BU loader, operating in 36" coal. Loader was readily converted to 32½" height.

Piggyback at sharp angle to 12 BU loading out breakthrough. Note operator is devoting full attention to loading.

Coal discharging from Piggyback in 30" height. 860 loader and 12 B[illegible] used in this operation.

Piggyback working behind 14 BU loader in full seam mining, moving out rock with the coal.

CUT LUBRICATION with this ONE



"Using LITHOLINE® saves several greases and guns!"

Now you can do all lubricating jobs just as well *if not better* with one grease and one gun, using Sinclair LITHOLINE.

Using Sinclair LITHOLINE is the modern, fool-proof, money-saving way to handle all your lubrication jobs. LITHOLINE converts servicing time into production time.

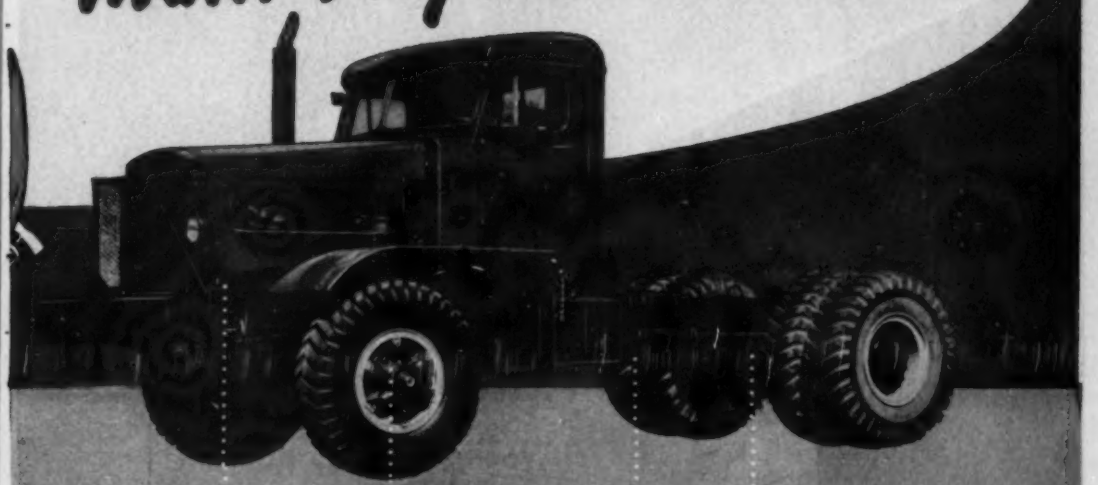
ADVANTAGES OF LITHOLINE over specialized greases:

- **SUPERIOR LUBRICATION AT EVERY POINT**
- **No danger of costly misapplication**
- **Quicker servicing, less downtime**
- **Smaller grease inventories**
- **Fewer dispensing units**
- **Less chance of contamination**
- **Less waste**
- **Simplified purchasing and distribution**

Send for free folder describing demonstrations showing the superiority of LITHOLINE. Write to your nearest Supplier of Sinclair Products or direct to Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

SINCLAIR

COSTS Multi-Purpose Grease!



Litholine stays put in WATER PUMPS

WHEEL BEARINGS are safe with Litholine

Litholine for lasting CHASSIS lubrication

Litholine is top quality for UNIVERSAL JOINTS

LITHOLINE for every lubrication job

CARBOLOY

perform

CC-2 COAL CUTTER BIT for all cutting machines, including continuous types, that employ ⅛" by 1" bits.

FINGER BIT for strip or underground mining. Does terrific job of gouging.

TWO-PRONG ROOF BOLTING DRILL for drilling through softer rock, such as shale, bony, and laminated sandstone.

AUGER DRILL BIT requires less pressure, sets up less vibration, saves armatures and bearings.

SOLID ROOF BOLTING DRILL for drilling in hard slate, hard shale, laminated limestone, and massive sandstone.

COMPREHENSIVE SERVICE PROGRAM

To help you get from Carboloy Coal Mining Tools everything we build into them, we offer these free services:

1. Complete, tuition-free training course for your key personnel. Features: instruction, demonstrations, correct grinding practices. Special discussions with your men on cemented carbides in relation to most efficient coal mining.

2. Assistance and advice of qualified Field Engineers and your local distributor.

3. Clear, concise maintenance-instruction manual and catalog, No. CM-100.

Coal Mining Tools
better in eight vital ways

Yes, in at least eight vital ways Carboloy Coal Mining Tools give you bonus performance. Here they are:

- Carboloy Coal Mining Tools cut more coal more freely in less time than any others would under the same conditions.
- Last longer.
- Take more regrinds per tool.
- Stay sharper longer between grinds.
- Carboloy Coal Mining Tools require less power.
- Put less wear on machines.
- Reduce time spent in bit changing.
- Require less time for reconditioning.

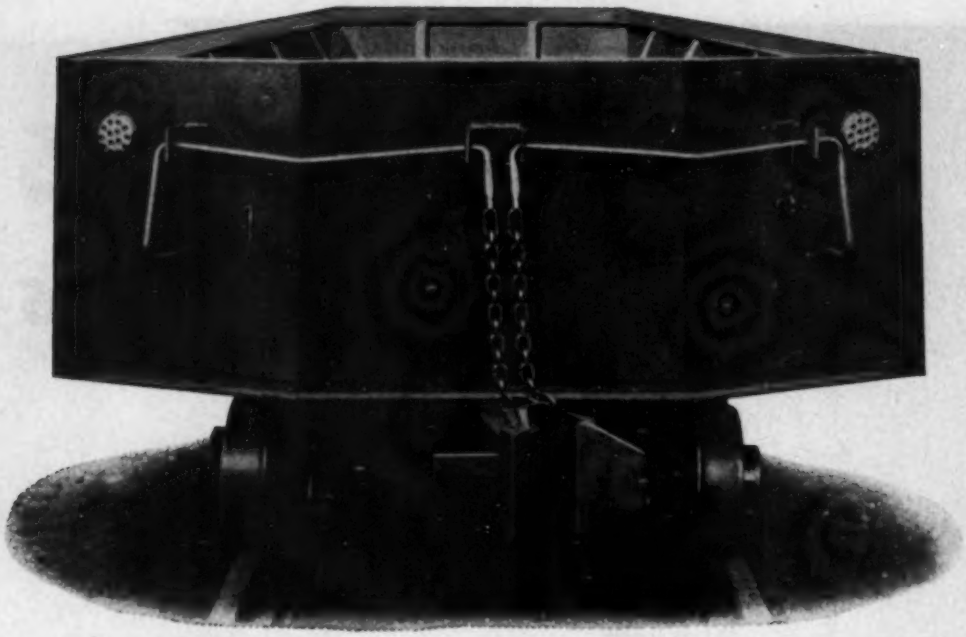
Three factors lie behind the amazing performance of these Carboloy tools: 1) lab-tested, mine-proved design; 2) large inserts of Carboloy Cemented Carbide, *hardest metal made by man*, combining high impact strength, toughness, near-diamond hardness; 3) twenty-nine quality tests that assure absolute uniformity tool after tool.

Get the bonus performance in Carboloy Coal Mining Tools. Write today for Catalog CM-100.

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY
11120 E. 8 Mile Ave. • Detroit 32, Michigan

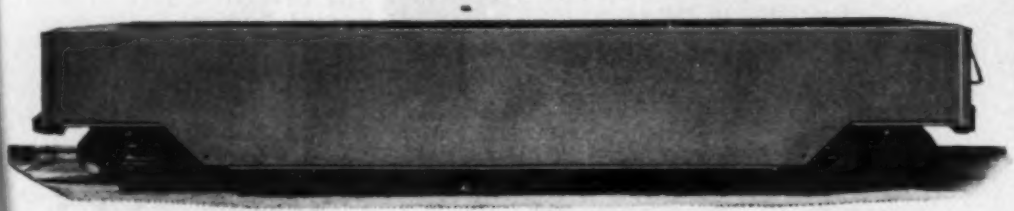
"Carboloy" is the trademark for the products of Carboloy Department of General Electric Company

Specify **CARBOLOY**
THE QUALITY BRAND OF COAL MINING TOOLS



Like Your Mine Cars BIG?

Bethlehem 17-ton car with cast-steel, high-speed trucks, automatic couplers, roller bearings, forged-steel wheels, and Mayari R corrosion-resisting body.



In today's high-production mines, the big car continues to prove its economy and overall value. This is shown pretty clearly by the increase in mine car sizes during the past few years. Till recently, a 10-ton car was a "big one." Now it looks practically dwarfed when compared with the Bethlehem car shown here.

Study the photos for a moment. They're pictures of a giant. This streamlined beauty, though lean and low to the ground, holds 17 tons. It's built for *loads* . . . and it's built to carry them year after year in the toughest kind of service.

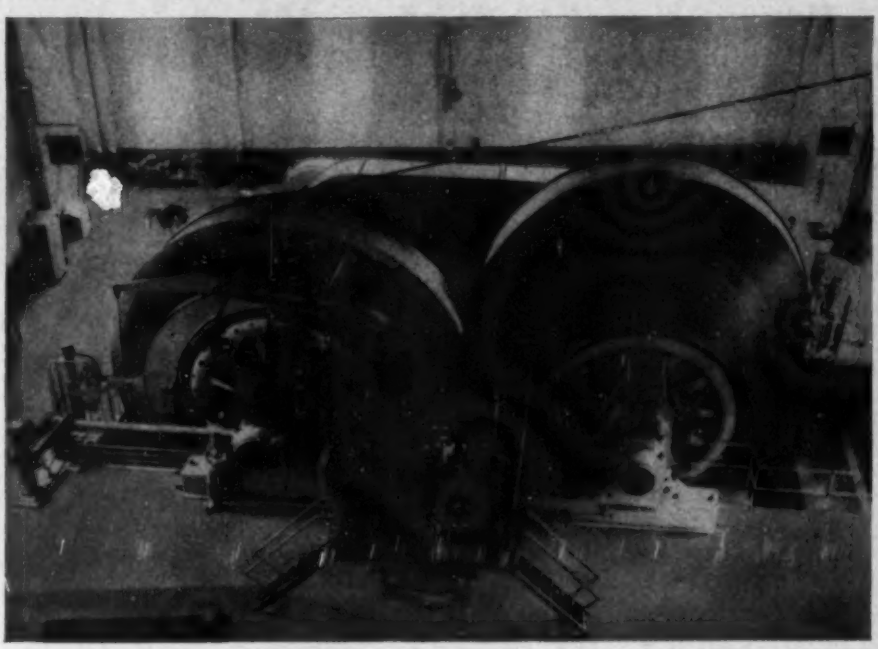
Bethlehem of course makes cars in all sizes, large and small. Many mines still hold a preference for smaller units, and we design and build plenty for this type of customer. Whatever your needs may be, always feel free to talk them over with us. Our engineers will do their best to work out mine car problems with you, any time you choose to call them.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

★ BETHLEHEM STEEL ★

WIRE ROPE



For shaft, incline and haulage service specify Roebling

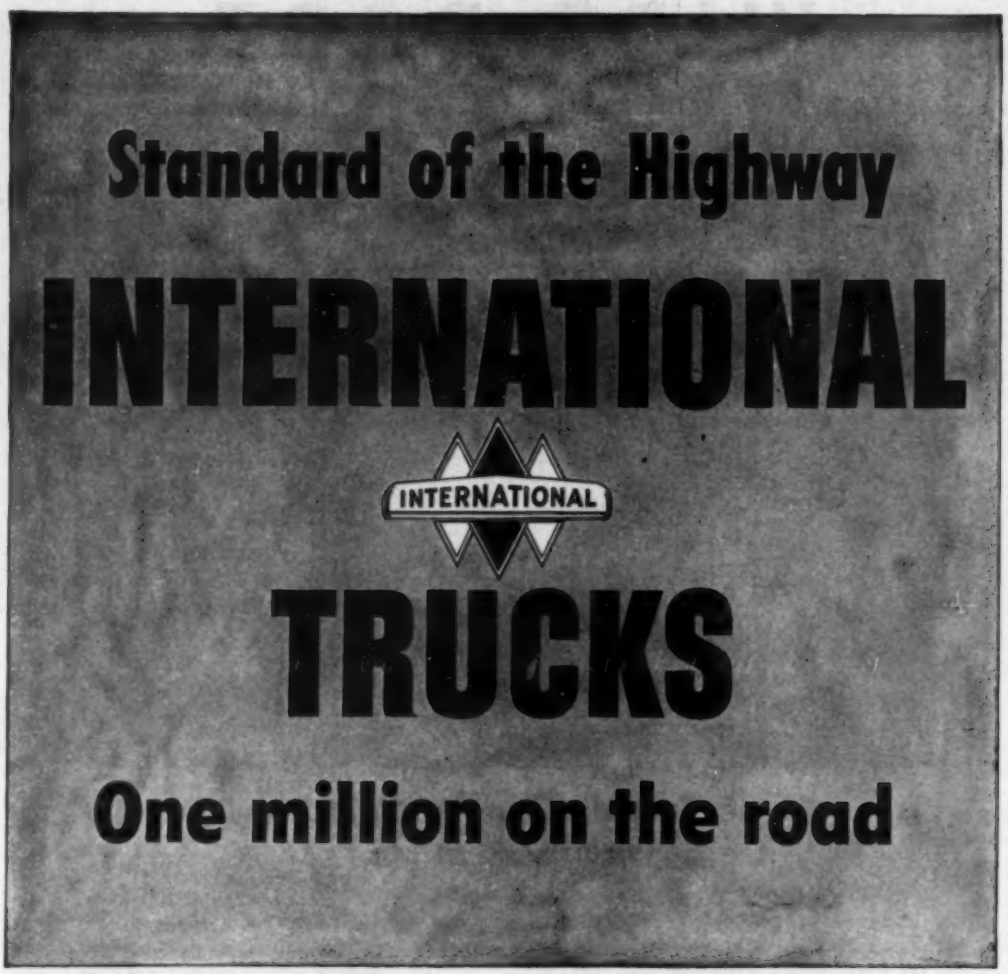
WHEREVER WIRE ROPE is subjected to excessive abrasion or bending and acceleration stresses . . . to heavy loads and high speeds . . . the proper Roebling Preformed "Blue Center" Steel Wire Rope will last longer and save money. "Blue Center" steel is an exclusive Roebling development that assures real toughness. Roebling Preformed also adds extra handling ease and smooth performance.

Roebling makes a full line of wire rope. Have your Roebling Field Man recommend the ones that will meet your needs with top efficiency and economy. And for biggest savings, get his advice on the correct use and maintenance of wire rope. John A. Roebling's Sons Company, Trenton 2, New Jersey.

ROEBLING

Atlanta, 934 Avon Ave ★ ***Boston,*** 51 Sleeper St ★ ***Chicago,*** 5525 W. Roosevelt Rd ★ ***Cincinnati,*** 3253 Fredonia Ave ★ ***Cleveland,*** 701 St. Clair Ave, N.E. ★ ***Denver,*** 4801 Jackson St ★ ***Houston,*** 6216 Navigation Blvd ★ ***Los Angeles,*** 216 S. Alameda St ★ ***New York,*** 19 Rector St ★ ***Odessa, Texas,*** 1920 E. 2nd St ★ ***Philadelphia,*** 230 Vine St ★ ***San Francisco,*** 1740 17th St ★ ***Seattle,*** 900 1st Ave, S. ★ ***Tulsa,*** 321 N. Cheyenne St

Export Sales Office, ***Trenton, N. J.***



A million trucks is an impressive number of trucks. It is even more so when you consider this fact: it represents more than half of the Internationals built in the past 44 years.

What proof could be stronger testimony that International Trucks are engineered to give you lower operating and maintenance costs over a longer truck life?

See your nearest International Truck Dealer or Branch for all the facts—join the next million truck users who will have the greatest truck value on the road.

International Harvester Builds McCormick Farm Equipment and Farmall Tractors... Motor Trucks... Industrial Power... Refrigerators and Freezers

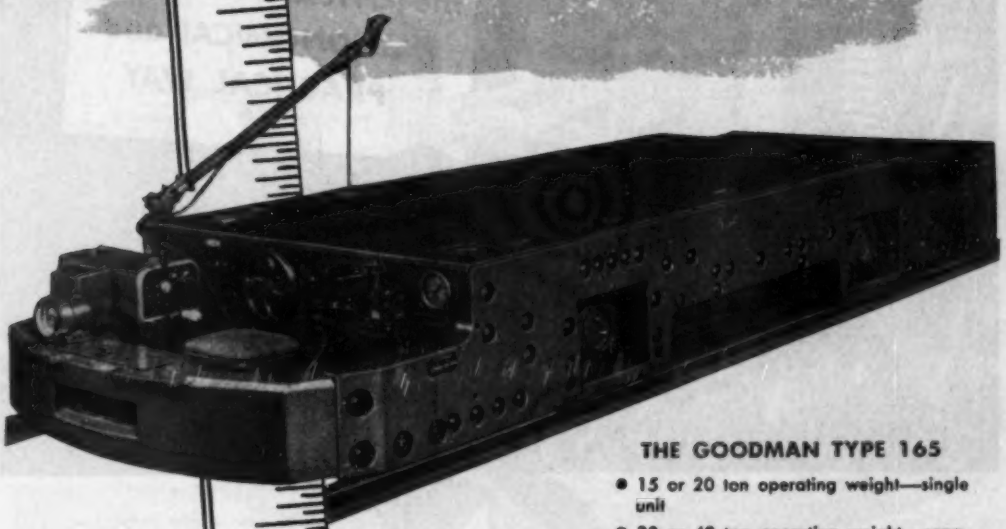
INTERNATIONAL HARVESTER COMPANY • CHICAGO

INTERNATIONAL INTERNATIONAL **TRUCKS**

"Standard of the Highway

A Mainliner
for long, heavy hauls in low coal

only 30" high!



THE GOODMAN TYPE 165

- 15 or 20 ton operating weight—single unit
- 30 or 40 ton operating weight—separable or permanent tandem hookup

OUTSTANDING ADVANTAGES FOR USERS OF THE TYPE 165:

— low over-all height (30") eliminates excessive haulageway construction costs

— with tandem hookup, weight is spread for high tractive effort on relatively light rail, short radius curves are readily negotiated

Construction Features

- slow speed armatures with single reduction gearing
- magnetic or pneumatic control including dynamic braking
- transverse equalizers
- air or hydraulic brakes

Your inquiries for complete details is welcomed.

Goodman MANUFACTURING COMPANY
HALSTED STREET at 48th • CHICAGO 9, ILLINOIS

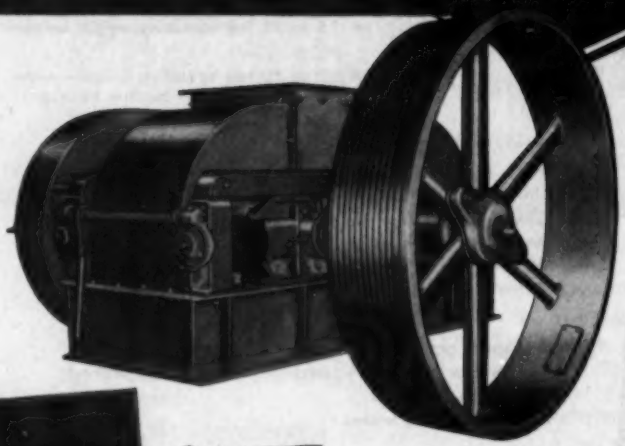
CUTTING MACHINES • CONVEYORS • LOADERS • SHUTTLE CARS • LOCOMOTIVES

the EFFICIENT ECONOMICAL and PRACTICAL WAY

McLANAHAN

Single and Double Roll

BLACK DIAMOND CRUSHERS



Used extensively throughout the anthracite and bituminous coal fields, these dependable McLanahan Black Diamond Crushers crack large or small lumps of coal or other materials to desired size with a minimum of fines. These machines are the answer to your coal crushing problems, and are built to handle high tonnages. Available in numerous sizes and types, these single and double roll crushers are constructed of steel, semi-steel, or fabricated steel, with babbitt or bronze bearings for a long life of satisfactory service.

Write Today
for Bulletin
BD-457

McLANAHAN & STONE CORPORATION
Pit, Mine and Quarry Equipment Headquarters Since 1835
Hollidaysburg, Pennsylvania

Representative Products: Single and Double Roll—and Jaw Crushers, Crushing Plants, Reciprocating Plate and Apron Feeders, Ball Grinding, Conveyors, Elevators, Screens, Scrubbers, Steel Log Washers, Sand Dryer, Hoists, Jigs, Dry Pans, Dryers, Scrap Bundlers, Pulleys, Gears, Bearings, Sprockets, Sheaves, Rollers, Bin Gates, Elevator Buckets, Gratings, Car Wheels, Ferrous and Bronze Castings.

J&L STEEL

TURN IN YOUR SCRAP — HELP BALANCE STEEL PRODUCTION!

You have some of the Mesabi Range cluttering up YOUR plant!

The iron and steel scrap in *your* operation—old machinery, parts, fixtures, etc.,—is worth twice its weight in precious Mesabi iron ore. Today this scrap is a vital natural resource. *Maximum steel production is impossible without it.* Every pound of scrap you can salvage is needed to help meet today's record demand for the steel to build a strong defense and to meet civilian needs.

COMB YOUR OPERATION FOR STEEL SCRAP NOW!

No matter what business you're in, you probably have more scrap than you realize. Appoint a responsible man to round it up. Set a date to have the job done. Your local scrap dealer will pay you for the scrap you collect. He'll speed it back into production. Act now. The need is urgent.

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH 30, PA.

FOLLOW THE LEADERS
IN LOW-COST BELT HAULAGE

This partial listing of producers using B-G Belt Conveyors—both above and under ground—should be of interest to anyone who wants to mine more tons per man-hour with lower operating and maintenance costs.

For over twenty years Barber-Greene Mine Conveyors have been identified with profitable mining operations. Specifically designed for mining service, they offer the added benefits of Barber-Greene "standardized" construction. Made up of standard packaged units—truss sections, drives, take-ups, frames, etc.—they are easily assembled, dismantled and relocated with 100% salvage—desirable features in any fast-moving mining operation.

For comprehensive information on why the leading producers choose Barber-Greene Conveyors, write for bulletin 676-A.

PARTIAL LIST OF B-G MINE CONVEYOR OWNERS:

Truax-Traer Coal Company
Peters Creek Coal Company
Cannelton Coal and Coke Company
The Hatfield-Campbell Creek Coal Company
The Carbon Fuel Company
Stonega Coke and Coal Company, Inc.
The Warner Collieries Company
Inland Steel Company
Chicago, Wilmington & Franklin Coal Co.
The Spruce River Coal Company
Bell & Zoller Coal and Mining Co.
Pond Creek Pocahontas Company
The Youngstown Sheet and Tube Co.
Clayton Coal Company
Seaner Mining Company
Pittsburgh Coal Company
Boone County Coal Corporation
Susquehanna Collieries Co.
Enterprise Coal Mining Co., Inc.
Johnstown Coal and Coke Company
Lake Superior Coal Company
Dawson Collieries
Blue Bird Coal Co.
Algoma Steel Corp., Ltd.
Landisburg Coal Co., Inc.
Carbonizing Coal Co.
Kirk Coal Mining Co.
Ashland Coal and Coke Co.
Pinnacle Coal Corporation
Turkey Gap Coal & Coke Co.
Alta Coal Division
Mary Frances Coal Co.
Atlas—P. & K. Coal Co.
South-East Coal Company
Boyles Coal & Supply Company

Barber-Greene

AURORA, ILLINOIS

EFFICIENT JOY MACHINES

INCREASE PRODUCTION AND REDUCE COSTS

JOY CUTTERS, LOADERS and SHUTTLE CARS always mean more tonnage at less cost per ton . . .

10-SC SHUTTLE CAR
New—heavy-duty—high-capacity

★

10-RU UNIVERSAL CUTTER
Fast-cutting—highly flexible

Write for Bulletins, or

Consult a Joy Engineer

WADCL 2408

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

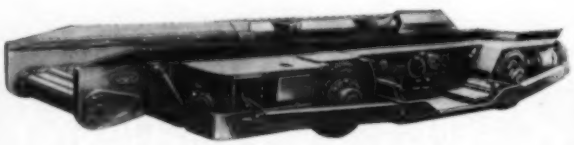
IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

12-RB CUTTER

A rubber-tire mounted, mobile, fast-tramming cutting machine only 26" high, supplied either as a bottom or top cutter. For slabbing, the cutter bar swings 90° to either side. Bar tilt, roll, and lift are fully hydraulically controlled. Hydraulic steering provides extra flexibility for easy maneuvering. 50 HP cutter motor provides ample capacity to keep ahead of the loader; separate motor drives the hydraulic pump.

20-BU-1 LOADER

Overall height is only 24", yet this machine can load up to 8 tons per minute. Employs the exclusive JOY loading principle, also a new JOY development: the conveyor is driven independently of the gathering arm drive. This makes possible continued operation of the gathering head while a shuttle car is away, to provide a fully loaded conveyor for quick loading of the car when it returns. Also permits continued loading even when gathering arms are momentarily stalled with hard digging.



8-SC SHUTTLE CAR

Four-wheel positive drive, four-wheel hydraulic steering—with a new, wider, tapered-end design that permits minimum turning clearance. Only 26" high, yet with level capacity of 2 tons. Centrally located operator's station gives equal visibility in either direction. Separate motors for traction, conveyor drive, and hydraulic pump drive. Exclusive JOY disc-type brakes on all four wheels—hydraulic cable reel and hydraulically-adjustable elevating discharge.

A HIGH CAPACITY Team for Very Low Vein Coal

We're proud to announce one of the greatest forward steps since the original JOY pioneering achievements in mechanical mining. *Now, for the first time*—with the advent of the JOY 12-RB Cutter, 20-BU-1 Loader and 8-SC Shuttle Car—high capacity production has become a reality for mines operating in very low coal. Here are some of the advantages. (1) The timing problems and labor of conveyor moves are eliminated in favor of the great flexibility and economy of shuttle-car mining. (2) The high mobility of JOY trackless equipment permits high-speed mining both on advance and retreat. (3) In case of a squeeze, only a few minutes are required to move all equipment from the section. ● *Call on us for any data you need.*

For thin or thick seams, whatever your operating conditions may be, JOY builds a complete, field-proved line of modern mining equipment to increase your tonnage and reduce your costs.

Consult a Joy Engineer

D CL 3410

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

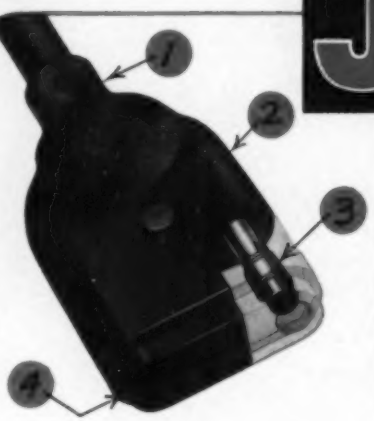
JOY PUSH-PULL STYLE

ELECTRICAL CONNECTORS

Your confidence in JOY Electrical Plugs or Receptacles is always justified. Job-proven on thousands of installations under every conceivable working condition during the past quarter-century, they're unequalled for performance, safety and durability. One-piece-molded-to-cable design (details at left) makes them water-tight, shatter-proof and amazingly age resistant . . . and because they're made of Neoprene, oils, acids, alkalies or moisture have little effect on their life span or conducting efficiency.

Available in a wide variety of conductor numbers and sizes, they are ideal for connecting electrical power to all kinds of portable machinery or semi-stationary equipment subject to periodic relocation.

Remember—JOY job-proven Plugs and Receptacles actually cost less because they last longer. *Ask for full details with descriptive literature today.*



1. One-piece, factory molded assembly strengthens cable connector junction
2. Tough, *molded-as-a-unit* Neoprene Jacket resists wear and increases safety
3. Expert Pin and Socket design (see below) insures low-contact resistance
4. Neoprene faces fit closely when engaged, insuring a water-sealed connection

CHOICE OF 4 JOB-PROVEN STYLES

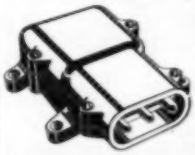
PUSH-LOCK . . . Slight twist during engagement locks connectors and prevents accidental disconnects. Available in 32 volt rating for welding needs. Also supplied in 600 and 5000 volt designs.

STANDARD OVAL . . . Best for general all-around use. Available in polarized three and four or non-polarized three conductor designs rated for operation at 600 volts or less.

STANDARD ROUND . . . A favorite of many years standing. Single Conductor designs available for 600 or 5000 volts . . . multiple conductor designs rated at 600 volts.

SHROUDED OVAL . . . Extended skirt or shroud on male plug guards contact pins. Available in polarized three and four conductor designs rated for operation at 600 volts or less.

WIDE SELECTION OF MATING RECEPTACLES

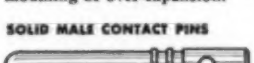


There's a JOY Receptacle or Gang (multiple outlet box) for nearly every standard electrical need. All have one-piece *replaceable* Neoprene inserts manufactured to the same exacting specifications set up for JOY Portable Plugs (see description above and at left). Many are available in choice of terminal back or pig-tail lead designs. UNIT ILLUSTRATED is Joy's No. 352MM, curved base three conductor Machine Receptacle.

SPRING LOADED FEMALE SOCKETS

Provide a long life of snug low-resistant contact. Spring-loading causes I.D. of socket to match O.D. of its mating male pin during engagement. Unique design prevents bell-mouthing or over-expansion.

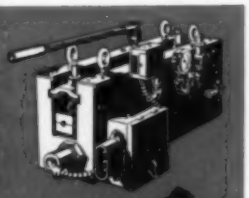
SOLID MALE CONTACT PINS



JOY Male Connector Pins have no split ends to collect dust or increase resistance. They are accurately machined as solid units from high quality rod, carefully selected for its low resistance and wearing qualities.

CABLE VULCANIZERS . . .

JOY Vulcanizers for repairing and re-jacketing cable splices, quickly pay for themselves. Two designs are available, "steam" and "direct heat". Both are electrically heated and have automatic temperature controls. Bulletin RV106 describes them in detail and lists mold vs. cable sizes. *Ask for your free copy, now!*



Consult a Joy Engineer

W&D ME3468

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

the ONE-TWO for maintenance costs

1 Gulf Mining Machine Lubricant
2 One of Gulf's Quality Hydraulic Oils

With Gulf Mining Machine Lubricant and one of Gulf's Quality Hydraulic Oils you can service almost any mining machine—and you eliminate as many as 3 oils and greases! Thus your lubricant storage and handling are greatly simplified and you avoid application errors at the face.

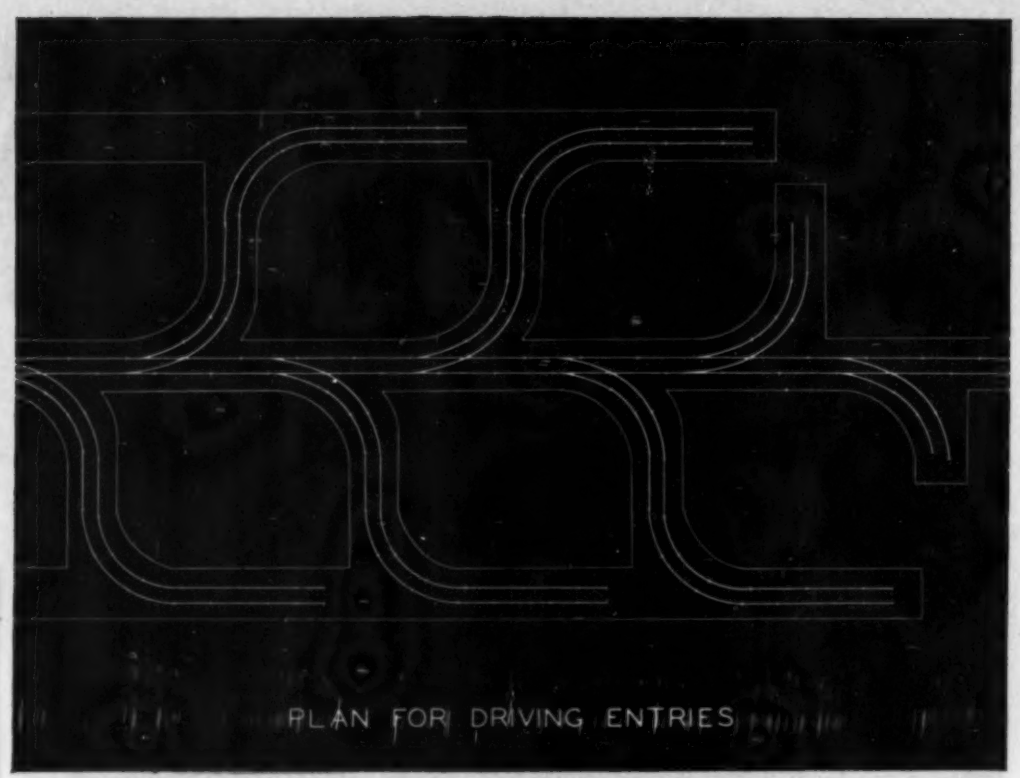
Just these two Gulf Quality Lubricants not only do the job of several other oils and greases, but do it better! Gulf Mining Machine Lubricant has a heavy body to insure less leakage from gear cases; exceptional adhesiveness that prevents throwoff or channeling; higher lubricating value that insures less wear; and it resists the washing action of water.

The proper Gulf Hydraulic Oil gives outstanding protection to each hydraulic pump—helps maintain system efficiency!

Call in a Gulf Lubricating Engineer today and ask him to explain in detail how these Gulf quality products for cutting and loading machines can give you effective help in your efforts to increase tonnage and reduce costs. Write, wire, or phone your nearest Gulf office.

Gulf Oil Corporation · Gulf Refining Company
GULF BUILDING, PITTSBURGH, PA.

FIFTY YEARS OF SERVICE
1901 GULF 1951
PETROLEUM AND ITS PRODUCTS



Here's a way to reduce track engineering costs

Engineering a track installation can often be pretty costly when a mine handles this work itself. To avoid needless expense, more and more operators are calling on Bethlehem for help in the planning and layout of new haulageways . . . or the modernizing of old ones.

Bethlehem maintains a staff of engineers whose sole job is to design good track and to help customers with their haulage problems. These Bethlehem technicians are thoroughly practical men who have spent years tailoring track to the needs of individual mines.

Here's how it's done:

Upon request, a Bethlehem engineer goes right to the customer's workings and studies them thoroughly, always bearing in mind the local conditions and plans for future expansion. Then he designs a layout that in every detail provides efficient haulage for that particular mine. The haulage system includes Bethlehem prefabricated track, which can easily be installed even by green crews with minimum supervision.

An example of a Bethlehem prefabricated layout is shown above. This may or may not be the type that best fits your needs. But in any case, track furnished by Bethlehem will be simple to install, simple to maintain; it comes with a minimum number of rail lengths and with all cutting and curving done in advance. You're saved the very substantial expense of engineering the job yourself — and you're equipped with modern track that can be taken up and reused again and again.

We haven't space to tell the whole story here, but full details are available through our nearest office. Whenever you say the word, a Bethlehem man will call and explain.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

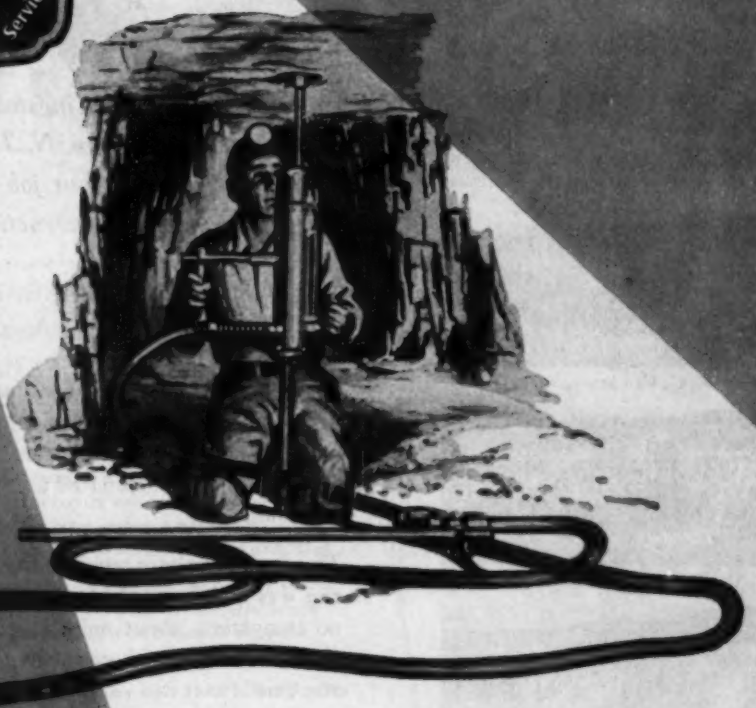
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

Export Distributor:
Bethlehem Steel Export Corporation

★ BETHLEHEM STEEL ★

BETHLEHEM PREFABRICATED TRACK

Thermoid
Industrial Rubber Products
Quality
Service



Hose built for the job! That's the reason for Thermoid's excellent reputation among users of hose.

Our customers know they can rely on Thermoid's recommendations . . . whether it's for air, suction, hydraulic, welding—or any of the many types of Thermoid hose built for the coal mining industry.

And men who buy these quality products like the service they get from Thermoid's experienced distributors and sales representatives—and their intimate knowledge of the *buyer's* problems.

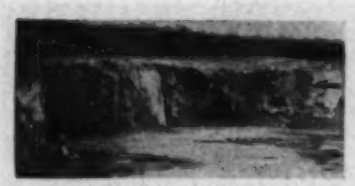
Get the hose built for *your* job. Specify Thermoid.

Thermoid

Conveyor & Elevator Belting • Transmission Belting
F.H.P. & Multiple V-Belts • Wrapped & Molded Hose

Rubber Sheet Packings • Rubber Products
Industrial Brake Linings and Friction Materials

Thermoid Company • Offices & Factories: Trenton, N. J., Nephi, Utah

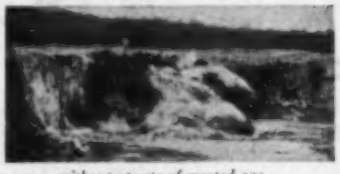


Just before the blast.

The holes begin to fire . . .

and the blast progresses . . .

across the face . . .



without spurts of wasted gas.

A well-shot pile!

Machine Gun Camera Tells the Story

Rockmaster ***at work in Kingston Trap Rock Company Quarry, Kingston, N. J., proves blasting control whether your job is coal mining, stripping, quarrying or construction.***

Twelve holes eighty feet deep were loaded with 9028 pounds of explosives—Apex #4 MV and 75% Giant Gelatin. Spacing was twenty feet; burden eighteen feet. Because it was important to minimize noise and vibration, ROCKMASTER milli-second delay detonators Numbers 1 through 12 were detonated at the bottom of the holes.

The quarry operator reported that even though this was a larger blast than he normally fired, no complaints about noise or vibration were received. And the photos show that breakage was *good!*

Ask your Atlas representative to show you the picture presentation of the ROCKMASTER story. He will show you through the eye of the machine gun camera how *you* can profit by using the correct numbers of the *sixteen* ROCKMASTER milli-second delay detonators teamed with the ROCKMASTER system of explosives choice and loading methods.

ROCKMASTER: Reg. U. S. Pat. Off.

ATLAS EXPLOSIVES *"Everything for Blasting"*

CHEMICALS ATLAS EXPLOSIVES

ATLAS POWDER COMPANY, Wilmington 99, Del. • *Offices in principal cities* • *Cable Address—Atpowco*

Prove for yourself why Gates Vulco Ropes are giving you longer V-Belt Wear!

Gates Vulco Ropes very competently handle the drive on this immense Jaw Crusher, said to be the largest ever built. It supplies most of the coarse rock for rip rap—and for secondary crushing—on the Detroit Dam project, Detroit, Oregon.

There is a very simple reason why Gates Vulco Ropes—the V-belts built with *concave sides*—are giving you substantially *longer wear*—and you can easily prove this for yourself in just 2 minutes' time!

Pick up *any* V-belt whatever and bend it as it bends when going around a pulley. As the V-belt bends, grip its sides with your fingers—and here is what will happen, every time.

If the belt you are bending is a *straight-sided* V-belt, you can *feel* its sides *bulge out* as the belt bends. This out-bulge forces the sides of the belt to press *unevenly* against the V-pulley—as shown in figure 1-A (see accompanying diagrams).

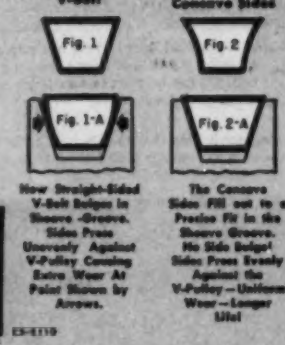
Clearly, this *uneven pressure* against the V-pulley causes the belt to wear *unevenly*—with the wear *concentrated* where the bulge is greatest—and this concentrated wear at one point naturally shortens the life of a *straight-sided* V-belt.

Now, make this same test with the belt that is built with Concave Sides—the Gates Vulco Rope!

Whereas you felt an *out-bulge* when you bent a belt with straight sides, you find that the *Concave Sides* merely fill out and become *perfectly straight*. The sides therefore *press evenly* against the V-Pulley. This distributes the wear *uniformly* across the *full width* of the belt. Naturally, this means longer belt life and *lower* belt *costs* for you!

Only V-Belts made by Gates are built with concave sides. Whenever you buy V-Belts, be sure that you get the V-Belt with the Concave Sides—The Gates Vulco Rope!

What Happens When a V-Belt Bends


Straight-Sided V-Belt
Gates Vulco Rope with Concave Sides
Fig. 1
Fig. 2
Fig. 1-A
Fig. 2-A
How Straight-Sided V-Belt Bulges in Sheave Groove. Sides Press Unevenly Against V-Pulley Causing Extra Wear At Point Shown by Arrows.
The Concave Sides Fill out to a Precise Fit in the Sheave Grooves. No Side Bulge! Sides Press Evenly Against the V-Pulley—Uniform Wear—Longer Life!

Gates

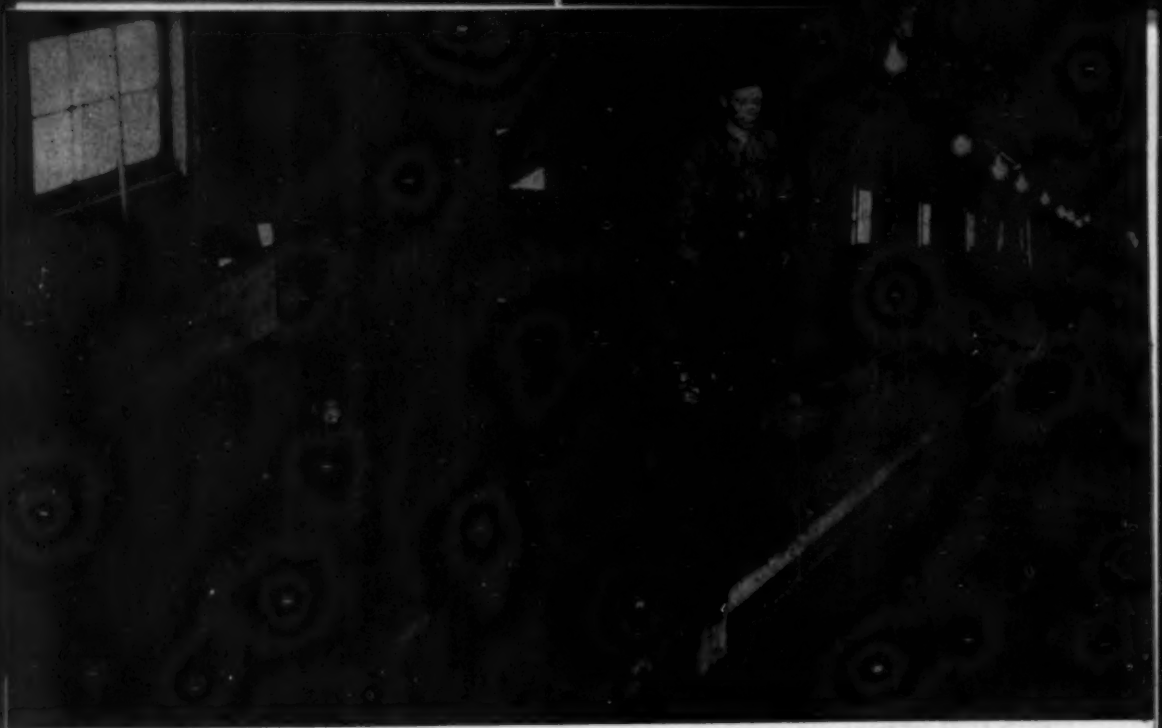
Have V-Belts Molded Rubber Goods Too (Industry)

VULCO ROPE DRIVES

ENGINEERING OFFICES AND JOBBER STOCKS IN ALL INDUSTRIAL CENTERS

THE GATES RUBBER COMPANY • DENVER • U•S•A

World's Largest Maker of V-Belts



Columbia-Southern Chemical's Midvale Mine finds that . . .

Modern tipple at Midvale Mine, where belt reinforced with "Cordura" rayon moves 3000 tons a day up a 136-foot lift. The belt, 576 feet between centers, is driven 350 feet a minute through hydraulic drive.

New and stronger belting (*below*) reinforced with "Cordura" rayon soon will replace 1000 feet of conventional belting in the mother belt at Midvale Mine.

Belt reinforced with "Cordura" rayon trains well under high operating tension

Despite heavy operating tension, this 30-inch slope belt at Columbia-Southern Chemical's Midvale Mine, Midvale, Ohio, trains perfectly—whether loaded or empty. It was manufactured by The Goodyear Tire and Rubber Company on a 4-ply fabric carcass made of Du Pont Cordura* High Tenacity Rayon.

Belting reinforced with "Cordura" rayon has been used since 1948 at Midvale Mine. Engineers there like its easy troughing, high strength and minimum stretch. Recently they ordered 1000 feet more for the mother belt.

Why do belts reinforced with "Cordura" rayon train better? Because "Cordura" rayon yarn is so much stronger than natural fiber yarns it permits a thinner belt with fewer plies. These thin belts are more flexible and sit firmly on the center idler whether loaded or empty, so they train better. And their low stretch saves costly shutdowns for take-up and resplicing.

Before you order your next conveyor belt, ask about the use of "Cordura" rayon in belts. We'll be glad to send you the names of suppliers of these belts . . . also give you full information about this Du Pont fiber in a new booklet "Sinews for Industry." For your free copy, address: Rayon Division, Room 4421, E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Delaware.

*REG. U. S. PAT. OFF.

Du Pont "Cordura" High Tenacity Rayon

STRENGTH AT LOW COST

DU PONT

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

ROCK RATED!

MEANS RUGGED STRENGTH

P&H MAGNETORQUE*

MEANS SMOOTHER, FASTER SWING

IF YOUR work calls for heavy going — in mine and quarry — here's the machine *designed* for it — the P&H 1055 (3½ yds.).

Here's tough, all-welded construction to take abuse in stride . . . extra stability so you can use all the power you need . . . speed and smooth operation in every function to give you maximum output.

MAGNETORQUE ELECTRIC SWING gives you faster swing, more accurate control with less strain on machine and operator. No more swing frictions with their adjustments and replacement costs.

See this real ROCK RATED shovel in action and judge for yourself.

*T. M. of Harnischfeger Corporation for electro-magnetic type clutch.

P&H

EXCAVATORS
4540 West National Avenue
Milwaukee 14, Wisconsin

HARNISCHFEGER

EXCAVATORS • OVERHEAD CRANES • HOISTS • ARC WELDERS AND ELECTRODES • SOIL STABILIZERS • CRAWLER AND TRUCK CRANES • DIESEL ENGINES • CAKE LOADERS • PRE-ASSEMBLED HOUSES

NO JOB TOO TOUGH . . .

Specially Designed by Wire Rope Specialists for Universal Dragline Service

Tuffy Draglines handle all kinds of material with equal efficiency. They are specially designed to fit all types of equipment . . . and to give longer service in digging, casting and loading operations. Mine owners choose Tuffy because of these features:

EXTRA FLEXIBILITY. Wires of the finest steel in a construction designed for universal dragline service, give Tuffy draglines the extra flexibility needed without sacrificing other qualities.

MAXIMUM ABRASIVE RESISTANCE. Obtained by finer radiuses in construction with maximum toughness to withstand more abrasive wear.

EASY TO HANDLE. It's pliable! Tuffy Draglines spool better and ride better on grooves.

MORE BEND OVER CASTING. Jerkings, pulling and bending stresses do not distort its pliable construction.

STAMINA PROVED IN ALL OPERATIONS. Operating in dry dirt, wet dirt, sand, gravel, rock and minerals and on all types of equipment, Tuffy Draglines stand up under more days of service and move far more yardage than the best previous average obtained by many operators.

EASY TO ORDER, STOCK AND INSTALL. No confusing specifications. Just [illegible]

OTHER Tuffy's MADE FOR MINING

TUFFY MINING TEAM

Mining Machine Ropes, Crab Motor Ropes, Winch Ropes—all Union-Formed (Preformed) designed to give maximum safety and service for specialized mining uses.

TUFFY SLUSHER ROPE

Improved 3x19 gives maximum resistance to abrasion . . . is rigid, non-collapsing to eliminate drum crushing, yet elastic and flexible enough to take up shock loads.

TUFFY SLINGS

Patented interlaced wire fabric construction gives extra flexibility and stamina. Proof-tested to twice safe working load. Non-kinking. Non-crushing. 10 types.

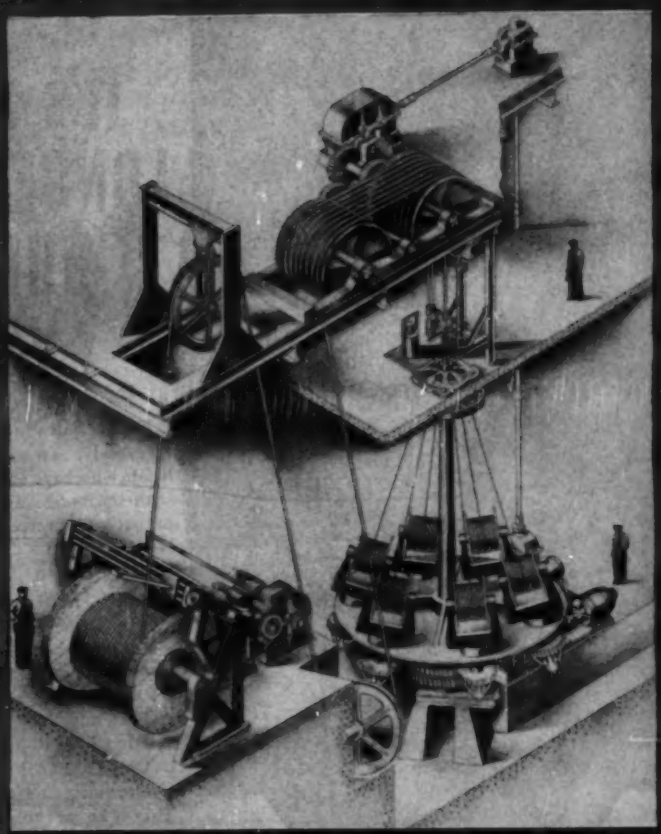
UNION WIRE ROPE CORP

union *Wire Rope* **corporation**

Specialists in Wire Rope

NO JOB TOO BIG . . .

for the makers of Tuffy® DRAGLINES



and other Wire Rope for Mining

Here's one of the few giants of the wire rope industry: It's Union Wire Rope's enormous closing machine that stands 4 stories high . . . has capacity for laying rope from ¾" to 4" in diameter . . . can turn out 27 tons of wire rope in one continuous length.

This machine is a vital part of the specialized modern equipment used in Union Wire Rope's great plant to produce Tuffy Draglines, live-straps, boom support ropes, hoist ropes, crowd and retract ropes, counterweight ropes, hoisting and closing ropes, and other special ropes for mining use.

See How Tuffy Can Help You Get Longer Service at Lower Cost

Three factual, illustrated folders explain Tuffy construction . . . show how mine operators use Tuffy special mining ropes for maximum service and economy.

SEND FOR FREE TWO FOLDERS TODAY

UNION WIRE ROPE CORPORATION

2150 Manchester Ave. Kansas City 2, Mo.

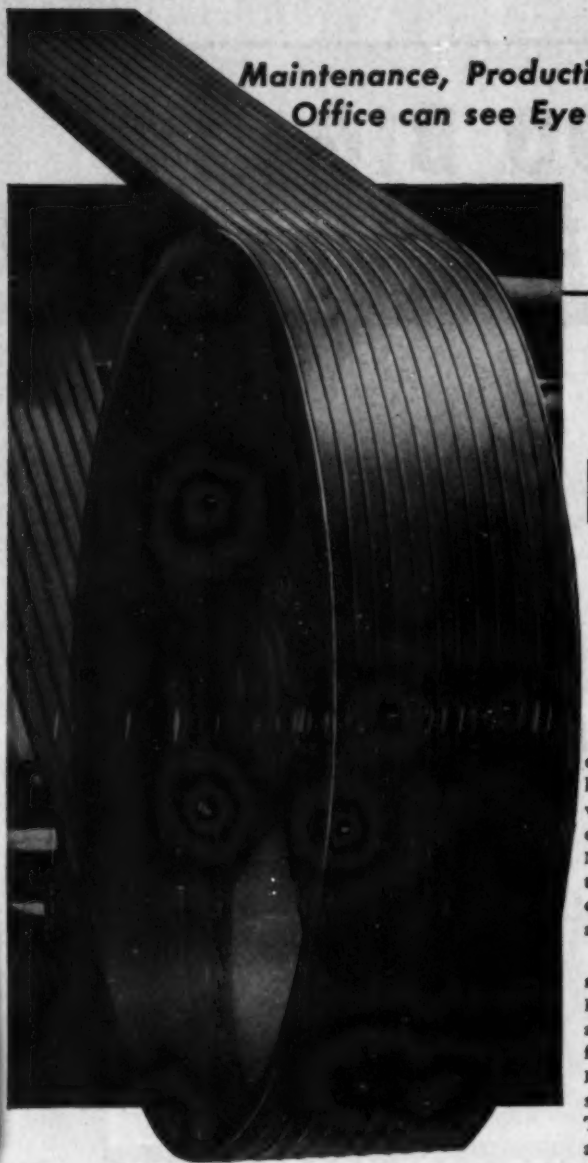
Please send information on ☐ Draglines ☐ Shovel Ropes ☐ Slings ☐ Mining Machine Ropes

Name _____

Address _____

City _____ State _____

Maintenance, Production, Purchasing and Front Office can see Eye to Eye on this "Baby"



It's a TOUGH, LONGER-LASTING BULL DOG V-BELT!

Yes, a Bull Dog V-Belt has something for everybody. Your engineers and production heads who have enough on their minds already with shortages and the necessity for increased output will appreciate the SPECIALLY ENGINEERED BWH CORD SECTION and its high tensile strength. They'll get the superior load carrying capacity from BULL DOGS and the ability to absorb shock loads that's needed.

Your maintenance men (engineers, too) will note the QUALITY CONTROLLED COMPOUNDS developed by BWH which run cooler and do not crack or deteriorate under severe flexing. They'll probably note also the MINIMUM STRETCH — due to a new and exclusive technique in processing Bull Dog Cords. They'll be *sure* to note the less slippage, fewer adjustments, longer belt life that results.

Your maintenance men will also okay the Bull Dog V-Belt's DURABLE COVERS. They're made of closely woven, heavy, bias-cut fabric that takes the torturous wearing action where the belt meets the sheave — seals it against the penetration of dirt, grease and moisture.

With it all adding up to less money *out* in belt repairs and replacements and more money *in* from maintained and increased production . . . don't you think Purchasing and the Front Office will be glad to go along?

BWH
DEPENDABLE RUBBERWARE

TOUGH PROBLEMS INVITED!
Ask us or your nearest BWH distributor about your power transmission belting, conveyor belting or hose problems. We're specialists in making mechanical rubber products work better, longer.

Another Quality Product of

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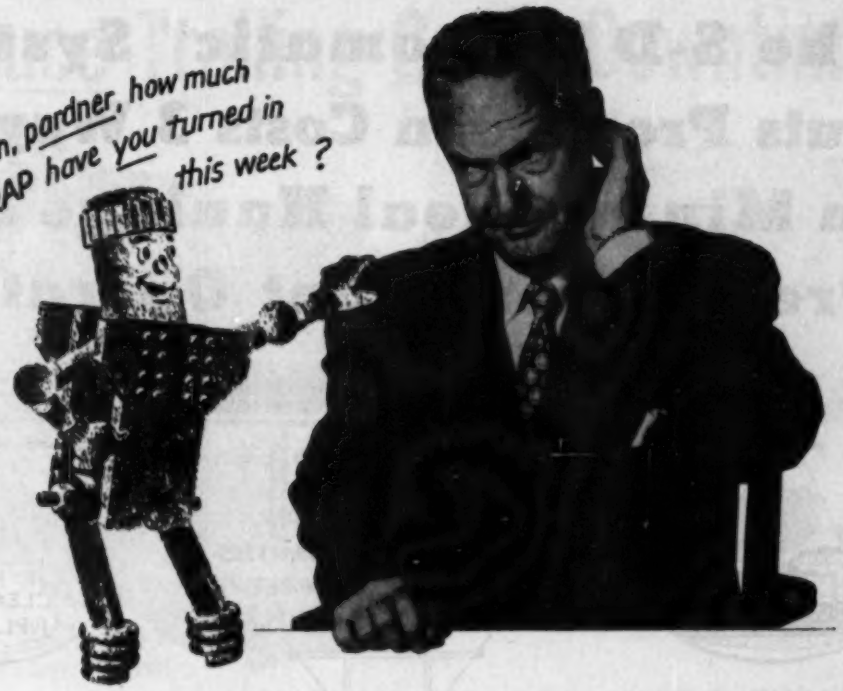

Today, the steel business is your business

—*it needs all your SCRAP, Now!*

SUPPOSE that every steel user were suddenly told that he had to turn in a half-ton of scrap before he could get a ton of steel. It would start the most gosh-almighty treasure hunt for scrap that ever happened.

In effect, this "no-scrap, no-steel" situation virtually exists. For without *all* the scrap that industry can search out and start on its way to the mills, steel production will surely drop. It's as serious as that.

More scrap is urgently needed. Today the mills are turning out more steel than ever before. But they're scraping the bottom of the barrel as far as scrap is concerned. Defense and domestic demands for steel simply cannot be met unless at least 100,000 tons of "purchased" scrap roll into the furnaces—*every day*.

The bulk of this scrap must come from industry. That's why we're asking for your all-out help. That's why it's so important that you make the drive for scrap part of your daily operations. Make it your business to encourage every employee to report any obsolete, broken or worn-out machinery, tool or equipment that has seen its day. From this dormant "junk" must come the heavy melting scrap that the mills need most. Don't let your scrap lie idle; send it on its way. How about it, pardner?

You'll find your local scrap dealers listed in the yellow pages of the phone directory.

This page would ordinarily be used to tell you about

U·S·S HIGH STRENGTH STEELS

but, because without SCRAP we cannot produce steel, we are asking instead for your all-out help in getting more SCRAP to the mills.

AMERICAN STEEL & WIRE COMPANY, CLEVELAND
COLUMBIA STEEL COMPANY, SAN FRANCISCO · NATIONAL TUBE COMPANY, PITTSBURGH
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM · UNITED STATES STEEL COMPANY, PITTSBURGH
UNITED STATES STEEL SUPPLY COMPANY, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

9-1338

UNITED STATES STEEL

The S-D "Automatic" System Cuts Production Costs 3 Ways... in Mining, Coal Haulage and Preparation Plant Operation

A continuous flow of coal from the face to the preparation plant is absolutely essential to low cost mining. The only dependable way this can be accomplished is through the use of an adequate surge bin which will serve as a temporary storage for coal in transit. The only practical method of filling a surge bin is with Automatic Drop Bottom Cars. This Surge Bin used with S-D "Automatic" Cars permits your mining operations and preparation plant to function independently of each other. For each to operate at the lowest possible cost, they must be carried on independently:

1. Any cleaning plant works best, and at the least cost, with an even continuous supply of coal. The Surge Bin continues to supply coal to the preparation plant when, for any cause, there is a delay at the face.

2. With an adequate surge bin, one shift operation of cleaning plant is often sufficient to take care of two shift operation of mine. Breakdowns or delays at the preparation plant need not stop mine production because the surge bin will take the coal until repairs are made.

3. S-D "Automatics" are the most economical means of coal haulage. Usually about 40% fewer cars are needed because of constant, on-the-move dumping. This lowers the initial installation cost and, of course, maintenance cost. These cars are sealed against dust leakage, reducing track clean-up costs to the minimum. Their bottom doors discharge coal in 1-2-3 order enabling S-D "Automatics" to fill a bin level full. S-D "Automatics" eliminate all manual dumping. This one item is enabling many operators to save thousands of dollars every year! The flexibility of S-D "Automatics" offers additional advantages such as: cars are not limited in size . . . top extensions may be added . . . cars with overlapping ends can be used.

Investigate the S-D "Automatic" System now! It may pay you in thousands of dollars annually. Write us today!

SANFORD-DAY IRON WORKS
KNOXVILLE TENNESSEE

Devoting Our Entire Capacity to the Building of Better Mine Cars for Over— 50 YEARS

Reduce Trailing Cable Downtime

From Portal to Face

Let your G-E distributor point the way to smooth operations with these G-E mining cables:

Trailing and Reel Cable
Power Distribution Cable
Lighting Cable
Aerial Cable
Direct-burial Cable
Mine Telephone Cable
Control Cable
Magnet Wire
Shot-firing Cord

Keep your mining operations moving. When toughness really counts—when cable operating continuity means production continuity—specify tough General Electric Geoprene cable.

The jackets on Geoprene cables actually show a tensile strengh far in excess of ASTM standards—tear resistance twice that of natural rubber. That's why G-E Geoprene cables stand long duty—withstand impact and abrasion.

Built for uninterrupted operation under difficult conditions, Geoprene cables have sturdy outer jacket and cushioning inner jacket designed to take real abuse. Cable-laid twine between jackets gives extra strength for extra service.

For a free booklet, *General Electric Wire and Cable for the Mining Industry,* describing G-E Geoprene portable cables and the full line of G-E mine cables, write Section W72-1014, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

You can put your confidence in—

GENERAL ELECTRIC

Announcing

THE AMETRON ELECTRONIC SCALE

THE NEW WAY TO WEIGH

- **ELECTRIC LOAD CELLS**
- **REMOTE INDICATION**
- **PRINTING RECORDERS**
- **LOW MAINTENANCE**

The Streeter-Amet Company of Chicago announces the new Ametron Electronic Scale. Streeter-Amet engineers, working with the engineers and scientists of the Baldwin-Lima-Hamilton Corporation have created this revolutionary weight determination instrument. By the use of electronic cells this new Ametron Scale will record and print on ticket, tape or even a ledger remote from the scale the exact weight.

Write for brochure explaining the simplicity of construction, the low maintenance and the ease of installation of this new scale.

- Crane Scales
- Remote Indicators
- Truck Scales
- Railway Scales
- Heavy Industrial Scales

STREETER-AMET COMPANY

4101 RAVENSWOOD AVE. CHICAGO 13, ILLINOIS

DISTRICT OFFICES:

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Birmingham, Alabama

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Taking coal for a ride . . . easier

With more than 300 cars handling coal at this midwest mine, lubrication of the wheel bearings could have become a real headache. That's why mine operators switched to SUPERLA Mine Lubricant No. 4 as suggested by a Standard Oil lubrication specialist over four years ago.

Already used in main transmissions and gathering heads of the mine's Joy loaders, SUPERLA Mine Lubricant No. 4 proved superior to other greases for wheel bearing lubrication as well. Leakage from the bearing housings was eliminated and consumption reduced. Motor men reported lower power requirements. Oilers found SUPERLA Mine Lubricant easy to withdraw from the barrel, easy to dispense with hand-operated guns. The versatility of SUPERLA Mine Lubricant No. 4 has both simplified the problem of inventory and reduced overall lubrication costs.

SUPERLA
REG. U. S. PAT. OFF.
Mine Lubricant No. 4

SUPERLA Mine Lubricant No. 4 has solved more than one problem in this mine. Chances are that it (or another SUPERLA Mine Lubricant) can do a similar job for you. There is a Standard Oil lubrication specialist located near your mine. For his help, call your local Standard Oil office today. Standard Oil Company (Indiana), 910 South Michigan Ave., Chicago 80, Illinois.

What's your problem?

J. A. Grieve, lubrication specialist at Standard Oil's Decatur office, helped this midwest mine use SUPERLA Mine Lubricant No. 4 to good advantage. He was close at hand, gave operators engineering service when they needed it.

There's a corps of Standard Oil lubrication specialists throughout the Midwest. You'll find one located near your mine. Through special training and a lot of practical experience, this man has gained a working knowledge of lubrication that can mean real savings for you. To obtain his services, simply contact the nearest Standard Oil office. Discuss with him the savings you can make with such outstanding products as:

STANOIL Industrial Oils.—Here's one line of oils that provides cleaner operation of loader and crane hydraulic units; supplies effective lubrication in compressors, gear cases, and circulating systems. One or two grades can replace a wide variety of special oils and lubricants.

CALUMET Viscous Lubricants.—On open gears and wire ropes, these greases strongly resist washing and throw-off. Their superior wetting ability affords better coating of gears and better internal lubrication of wire rope.

STANDARD OIL COMPANY STANDARD *(Indiana)*

in WIRE ROPE, too it takes the RIGHT KIND of muscle

The long flat muscles of the black panther give him the spring and suppleness he needs to survive in his particular environment. They're ideal for the job they're called upon to perform.

So, too, with wire rope! Specific jobs call for the right kind of muscle; the right construction and lay of the rope; the right grade of steel and size of wire...to best withstand the destructive forces encountered.

Wickwire Rope gives you the benefit of long experience and specialized know-how which assures you of exactly the right kind of rope your particular job demands.

For additional information write or phone our nearest sales office.

THE COLORADO FUEL & IRON CORPORATION—Abilene (Tex.) • Denver • Houston • Odessa (Tex.) • Phoenix • Salt Lake City • Tulsa
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WICKWIRE SPENCER STEEL DIVISION—Boston • Buffalo • Chattanooga • Chicago • Detroit • Emlenton (Pa.) • New York • Philadelphia

LOOK FOR THE YELLOW TRIANGLE ON THE REEL

WICKWIRE ROPE

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PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL & IRON CORPORATION

The Story of Maumee's Chieftain No. 20 — Another

ALLIS-CHALMERS

Equipped Preparation Plant

Here's Modern, Mechanized Coal Cleaning—500 tph—Low Cost per ton

TO MEET INCREASED demands for high quality coal, cleaned to graded specifications, Maumee Collieries erected the modern washing plant shown in pictures on the following pages. Chieftain No. 20, at Riley, Indiana, is an excellent example of a coal operation in which full utilization is made of today's time and cost-cutting equipment.

The entire cleaning process is flexible and as nearly automatic as careful planning and skillful engineering can make it. The result is efficient, low-cost coal production.

Notice the extent to which Allis-Chalmers equipment is used in this operation. Vibrating screens . . . pumps . . . motors . . . electrical equipment. Allis-Chalmers has been an equipment supplier for coal for more than 50 years . . . has developed a number of products specifically for coal, such as the CW solids handling pump and the *Low-Head* vibrating screen with end-tension deck construction for dewatering and sludge recovery.

The Allis-Chalmers representative in your area is a trained equipment application engineer. He can be an invaluable help to you in getting top results in coal cleaning at low cost per ton. He'll be glad to look over your operations. Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3510

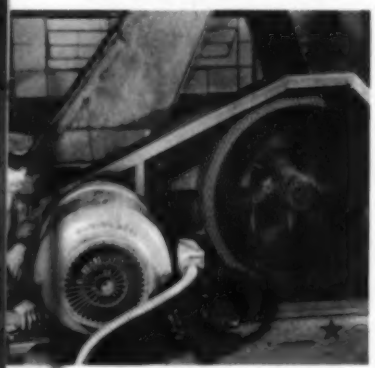
ALLIS-CHALMERS

HOW ALLIS-CHALMERS FITS INTO THE COAL

1 In strip pit, this walking dragline operates in parallel-tandem with an electric shovel . . . strips out coal in 25-yard "bites." Dragline has 215-ft boom and a reach of 430 ft.

2 Seven supercharged diesel semi-trailers speed run-of-pit coal from stripping operation to cleaning plant over private haulageway. Each of these units is 325 hp and is equipped with torque converter transmission. Each has capacity of 40 to 45 tons.

3 Main conveyor moves coal from truck unloading hopper to top of washing plant. Conveyor system in this plant is arranged to give utmost flexibility to movement of coal through tipple.

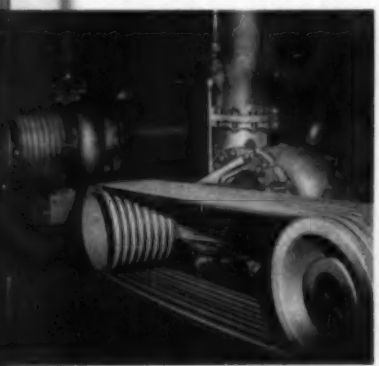


7 Another Allis-Chalmers motor drives a middlings crusher, which reduces large-size classified coal to minus 2 in. This motor is a 40-hp, totally-enclosed unit, with *Texrope* drive.

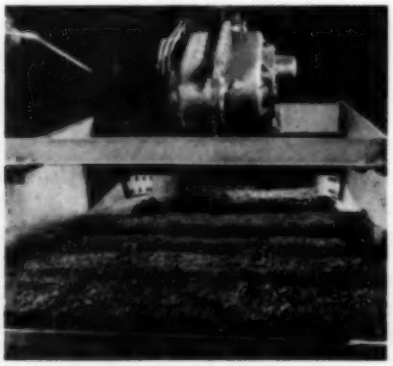
This modern washing plant is equipped 100% with Allis-Chalmers motors. There are 55 motors installed here — all Allis-Chalmers — ranging in size from 1½ to 125 hp.

NOTE: ★ *Indicates Photograph Showing Allis-Chalmers Equipment.*

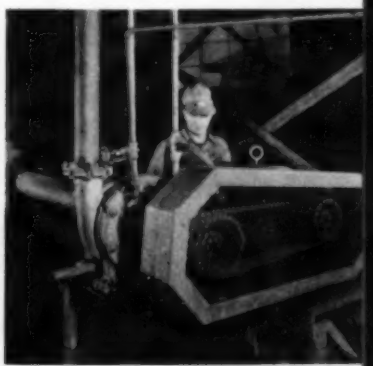
8 Air-pulsated jig cleans all minus 3-in. coal. From here, coal goes to stationary dewatering screens for water removal, then to classifying screens for size separation and mixing.



11 4000-gpm CW pumps are driven by Allis-Chalmers 125-hp splash-proof motors through *Texrope* drives. *Texrope* V-belts have tough, rubber-impregnated cover which seals out grit.

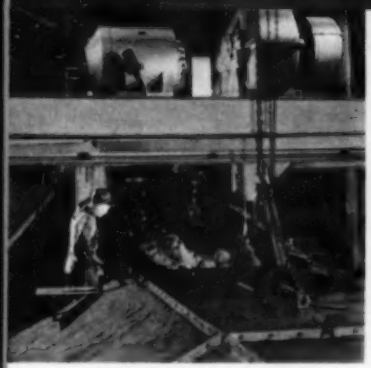


12 Two gravity-fed, 5 x 14 ft *Low-Head* vibrating screens recover 10x28 mesh fine coal from dewatering screen refuse. Operated in tandem, the first screen is used for fresh-water spraying and dewatering; the second, shown above, for dewatering only.

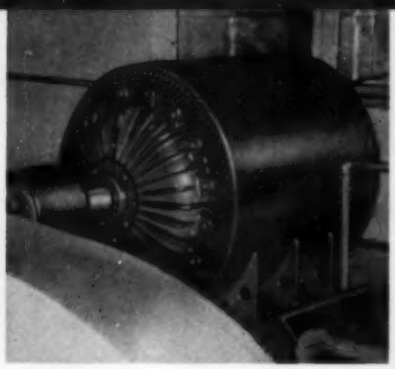


13 28-0 mesh refuse from *Low-Head* sludge screens is pumped to pond by this 5x4, 100-gpm, 40-ft head Allis-Chalmers CW solids handling pump. Pond is a half mile away.

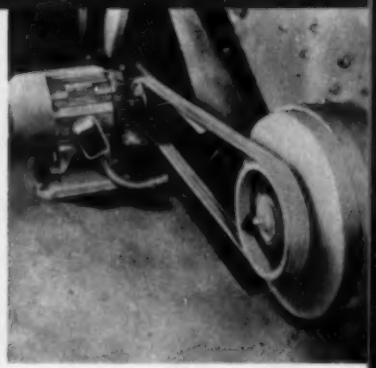
PREPARATION PROCESS AT CHIEFTAIN NO. 20 MINE



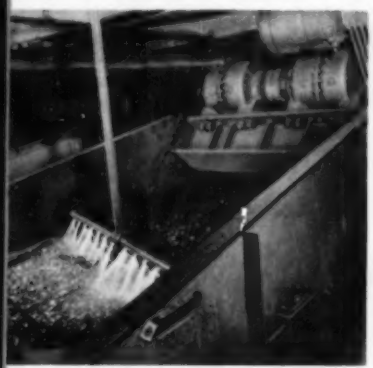
4 Conveyor, which discharges to scalping screen, is driven by 100-hp, tube-type, totally-enclosed fan-cooled Allis-Chalmers motor. Dirt and corrosion can't harm motor of this design.



5 Close-up of tube-type motor shows nest of tubes through which fan-driven cooling air carries away motor heat. Tubes are straight, with no pockets or crevices to trap dirt. Oil film can be removed with long-handled brush, without stopping motor.



6 Scalping screen is driven by 7½-hp, fan-cooled Allis-Chalmers motor through *Texrope* V-belt drive. This screen discharges to revolving breaker. Shale and hardheads go to refuse bin.



9 Minus ¾-in. coal from classifying screen goes to these 6x16-ft double deck *Low-Head* vibrating screens which dewater and also make separations ¾x ⅜, ⅜x10 mesh and minus 10 mesh.

IN SCORES OF WASHING PLANTS

Low-Head screens are used for:

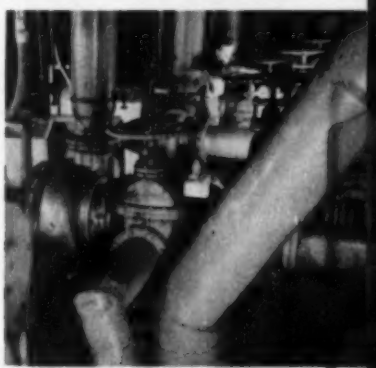
- Coal and sludge dewatering.
- De-sliming and pre-wetting.
- Draining and washing media.
- Sludge recovery and water clarification.
- Dewatering washer refuse.
- Dewatering and sizing middlings.

Ripl-Flo screens are used for:

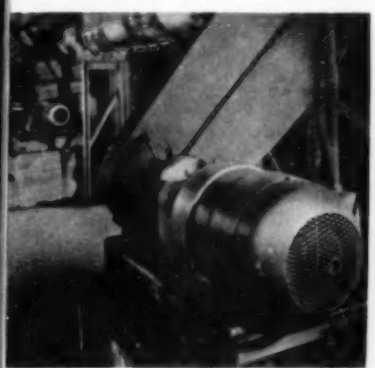
- Scalping ROM (Extra Heavy Duty screen).
- Sizing raw coal ahead of washers.
- Sizing to egg, range, nut, stoker grades.
- Dewatering and sizing middlings.
- Dewatering coarse coal and washer refuse.
- Dry screening medium or small moist coal.

Aero-Vibe screens are used for:

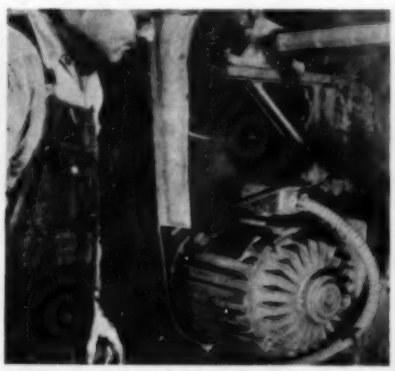
- Sizing raw coal and middlings.
- Sludge dewatering.
- Dedusting.
- Dewatering after chloride washers.



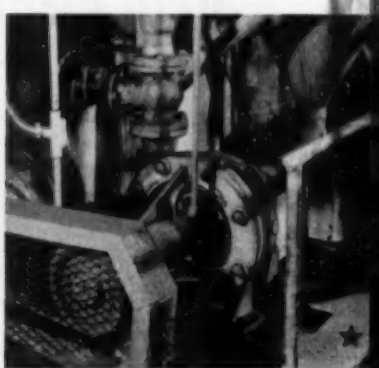
10 Three 12x10, 4000-gpm CW solids pumps recirculate water for fine coal dewatering. Minus 10 mesh coal from *Low-Head* screens and fixed screen is pumped through settling cone.



14 Multi-louver dryer removes surface moisture from ¾ x 0 coal. Screw conveyor to dryer is driven by 10-hp, totally-enclosed, fan-cooled Allis-Chalmers motor shown above.



15 Stoker feeder on multi-louver dryer is driven by this side-mounted 1½-hp Allis-Chalmers motor of totally-enclosed, non-ventilated design. Additional cooling area provided by external fins gives this motor extra cooling capacity in hot, dirty locations.

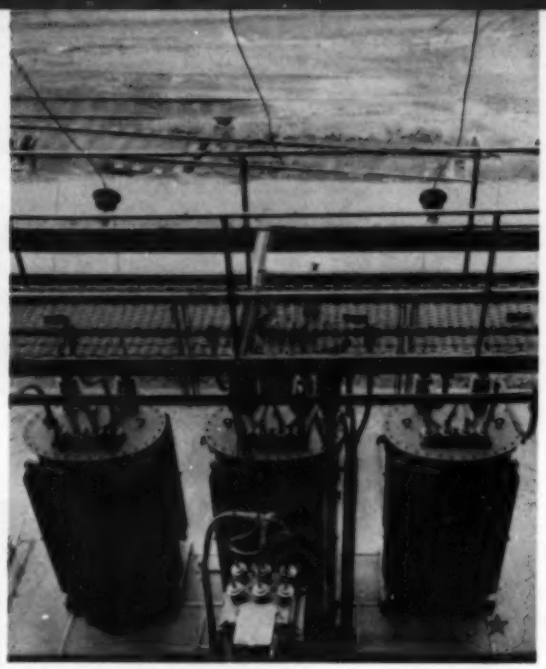


16 Effluent from centrifugal dryer is pumped to settling cone with this 4x3, 300-gpm CW solids handling pump. Allis-Chalmers CW solids pumps can handle 40% solids in suspension.

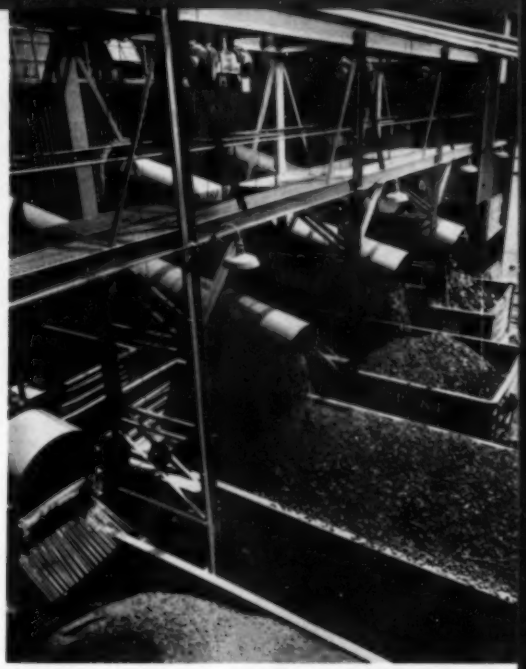
FOR DEPENDABLE PERFORMANCE

ALLIS-CHALMERS

ALLIS-CHALMERS BUILDS EQUIPMENT FOR COAL PROGRESS



17 Bank of Allis-Chalmers 500 kva distribution transformers step down line voltages to voltages used in preparation plant.



18 Loading booms portion out coal, graded to commercial sizes, to railroad cars. Sizes can be conveniently changed.

Chieftain No. 20 is Maumee's Sixth Plant

A LONG RECORD of satisfaction with Allis-Chalmers equipment in Maumee's five other plants was a big consideration when it came to specifying equipment for their sixth preparation plant.

Past experience had proved Allis-Chalmers equipment a practical investment . . . in terms of real savings in down time and maintenance.

Another consideration — Allis-Chalmers field engineers call back after equipment is installed, to make sure it keeps on operating satisfactorily.

19 Loaded cars roll over automatic scales for weighing. Modern machinery has made it possible to produce quality coal at minimum cost and with minimum personnel.

ALLIS-CHALMERS

Low-Head, Rigi-Flo, Aero-Vibe and Texrope are Allis-Chalmers trademarks.

Pioneers in Electrical Power Equipment — Biggest of all in Range of Industrial Products.

What He's Gained by Keeping Records on Wire Rope

This man buys and uses a lot of wire rope. For years he never knew exactly which brand was giving him the best service. Then he realized he'd better find out; it could save him important money.

So now he's keeping records on all his major ropes. He knows the date they go to work, the type of work they do, and just *how much* they do. His records enable him to check on different brands; they show him which make of rope is doing the biggest job per dollar spent. And he's wondering why he didn't adopt the system years ago.

Do you keep records like this? We at Bethlehem encourage the practice, for it's the only real way you can determine a "good buy" in rope. And when Bethlehem rope is involved in any comparisons you make, we naturally feel that it will soon demonstrate its basic soundness, durability, and all-around economy.

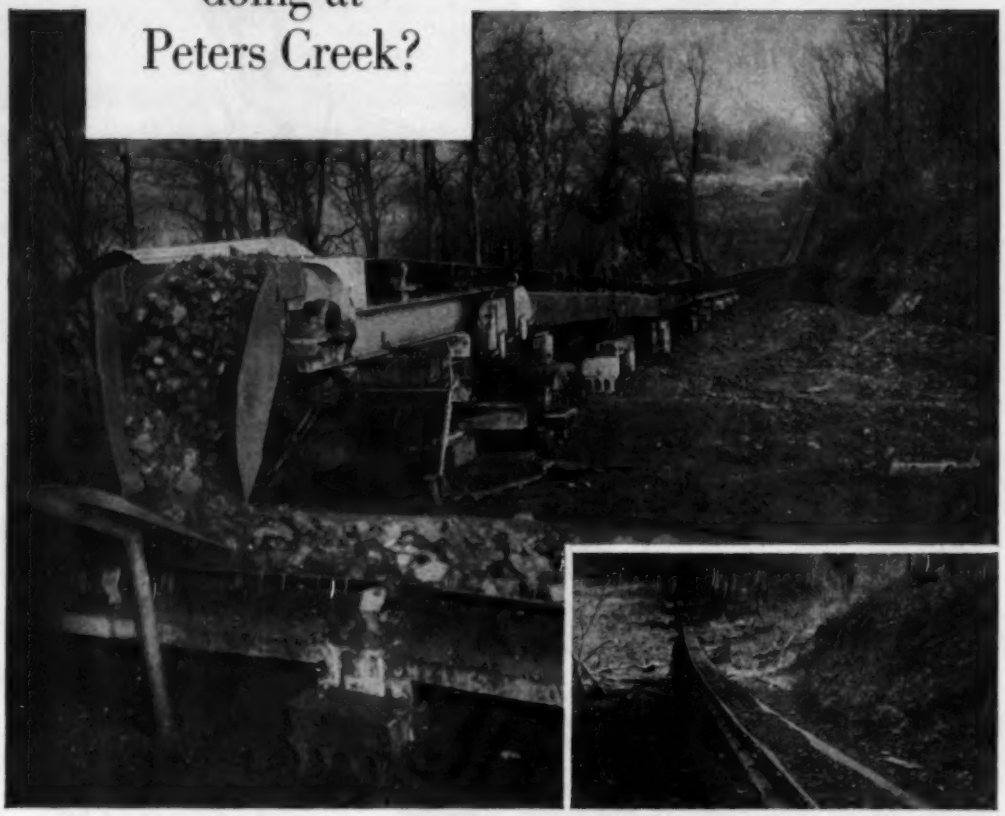
In every detail the Bethlehem product is made to the highest standards of quality. If it were not, we'd be foolish to suggest a means of comparison with other brands. But the plain truth is, Bethlehem wire rope will slug it out on any job you have . . . and your own records will prove it!

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

LET YOUR RECORDS TELL YOU!

What's U.S. Rubber doing at Peters Creek?



Large photo shows coal being transferred from one belt of 3100' centers to belt of 1700' centers. Small photo shows section of the 3100'-center belt. Note the troughability and excellent training.

ITS BELTS are carrying 300 tons of crushed coal per hour. These belts, three in number, are known as U.S. Giant 4-ply Style XN Conveyor belts, of patented nylon construction. They connect the crusher to the tipple of Peters Creek coal mine. The belts replaced 10-ton trucks which always became mired in winter mud. This unusual conveyor installation provides a steady, dependable flow of coal over hills and through valleys, saving trucking and handling.

When you have a coal haulage problem, call in a U.S. Rubber engineer. He is a specialist in overcoming obstacles, lowering haulage costs.

Here the 1700' center belt carries the coal along to the tipple. Note how it "contours" or hugs the terrain, taking the straightest possible course to its destination.

PRODUCT OF U.S. RUBBER — SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

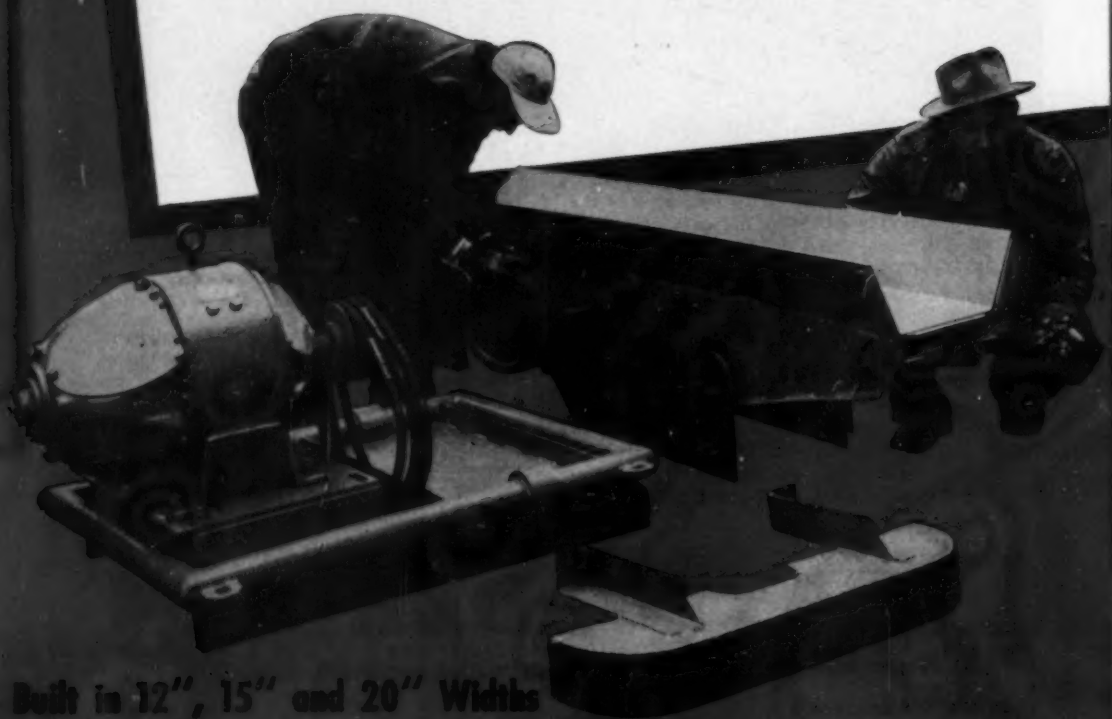
The 1½ cu. yd. Model HM is the largest of the complete PAYLOADER line and the most powerful wheeled tractor-shovel available. Its four wheel drive and large earth-mover tires gives you fast-action traction on clay, mud or sand . . . provides crawler-like traction at far less maintenance expense, PLUS speed when you want it.

Some of its many applications are cleaning tops of coal veins, feeding stripping shovels, loading trucks, maintaining roads, moving tools and supplies . . . lifting, pushing, carrying. This special tractor-shovel operates easily and maneuvers fast because it has power-boosted steering and full reversing transmission with four speeds forward and four reverse. Double-action hydraulic rams raise and lower the booms and dump and close the bucket with finger-tip effort . . . exert tons of down-pressure for tough digging conditions.

See the Model HM in action and you'll understand why it has made a hit in pits and around tipples, yards and plants. The Frank G. Hough Co., 735 Sunnyside Avenue, Libertyville, Illinois.

Literature on the big 1½ yd. Model HM and six smaller PAYLOADER sizes, down to 12 cu. ft. bucket capacity, is yours for the asking.

In the JOY FA CHAIN CONVEYOR you get the advantages of COMPLETELY NEW DESIGN



Built in 12", 15" and 20" Widths

Simple V-Belt Drive

No troublesome flexible coupling to line up, service and maintain.

Integral Speed Reducer saves 500 lbs.

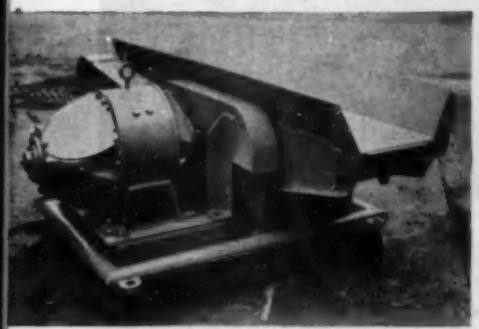
Highly efficient helical and spur gear reducer. Tucked away under the trough and protected.

This section easy to handle and move... when removed from base, it's on its own skids.

Easy to Reverse - and in far less time

Much simpler operation. Far fewer parts to handle and less man-hours required.

Requires 4 sq. ft. less floor space



For complete information on the Joy FA Chain Conveyor, write for Bulletin LD-200

Can be used in more restricted areas. More compact, easier to install, requires less level foundation space.

Consult a Joy Engineer

W&O CL 5740

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

Tonnage increased over 10%—

Costs reduced materially, with

Baker-Fletcher Roof Drill and Wrench

● This rugged and compact self-tramming permissible drilling and bolting machine is setting new performance standards. At a large operation in Indiana, for example, it established the following records:

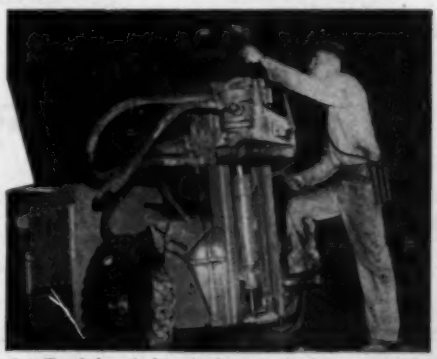
Average number of bolts per shift	over 100
Maximum number per shift	151
Fastest time for one room (9 bolts)	20 min.
Drilling speeds	Better than 10 ft. per min.
Bolt tightening time	3 seconds
Height of seam	5½ ft.
Length of bolts	5 ft.
Composition of roof —	Dense Limestone and sulphur balls
Life of drill bits (standard carbide tipped)—250 feet before resharpening (only 2 bits required per shift)	
Other benefits—Tonnage improved over 10%, roof control cost materially reduced.	

Illustrations and captions show how it operates.

Before you buy roof control equipment, get all the facts about this new Baker-Fletcher Roof Drill and Wrench.

Machine trams into position, ready for drilling. Full speed range hydraulic tram in either direction with third wheel steer, allows operator to position quickly for each hole. Bolts, plates, expansion shells, and drill steels are carried in tray on machine.

Drilling the hole. Special torque-controlled feed allows operator to drill at almost unbelievable speeds. Increases bit life, too. Rigid straight line motion makes hole true, permits high feed pressure for drilling hardest rock.



Installing bolt and plate. At the turn of a lever, wrench is ready to bring the bolt up tight. No auxiliary wrenches are needed to obtain high speed, high volume bolting. Hydraulic control assures constant torque on bolt.

Manufactured by

THE BAKER-RAULANG CO.

1213 West 80th Street • • • Cleveland 4, Ohio

Exclusive Coal Mine Representatives

J. H. FLETCHER & CO.

Chicago, Illinois • • Huntington, W. Virginia

Baker MINE EQUIPMENT

VICTOPRENE OIL SEALS

UNDER TOUGH OPERATING CONDITIONS

Victoprene Oil Seals assure clean sealing of rotating, oscillating or reciprocating shafts of all sizes under all conditions. The oil seal element is Victoprene elastomer, which has proven the material most highly resistant to oil, grease, heat, age, etc., that break down the ordinary seal. This molded sealing element is permanently bonded to the metal shell. A garter-type tension spring provides tight sealing by automatically compensating for shaft eccentricity and housing misalignments. One of the full line of Victoprene Oil Seals will solve your sealing problems. They are available in stock in the widest range of shaft sizes. Why not let us recommend the proper seal for your purpose. Call your "Bearing Specialist" today!

FREE TO USERS OF ANTI-FRICTION BEARINGS. The "AFBDA Bearing Maintenance Report," a digest published regularly giving all information, old and new, on proper maintenance and service. WRITE FOR IT TODAY.

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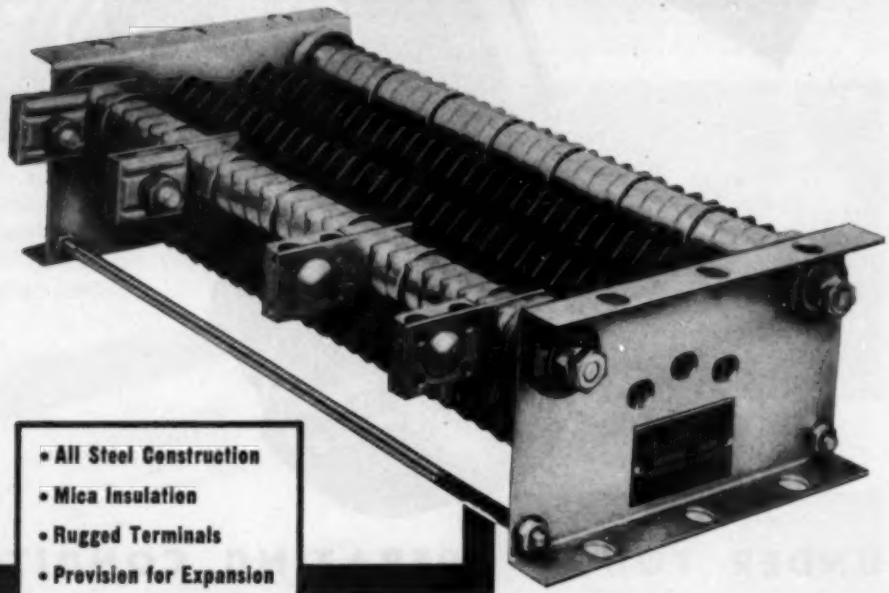
417 Dale Avenue • KNOXVILLE, TENNESSEE

A Grid Design

TO ELIMINATE HOT SPOTS...

***and* INSURE EVEN HEAT DISTRIBUTION!**



- All Steel Construction
- Mica Insulation
- Rugged Terminals
- Provision for Expansion
- Adequate Ventilation
- Unaffected by Vibration or Moisture
- Corrosion Resistant

The unique shape of P-G Resistor Grids permits unusually even heat distribution over the entire grid surface. Since each part of the resistor element has relatively equal exposure to the air, heat is rapidly dissipated and hot spots fail to develop. For trouble-free, heavy-duty service, you can safely specify P-G.

P-G

The Nonbreakable Steel Grid Resistor

THE POST-GLOVER ELECTRIC COMPANY

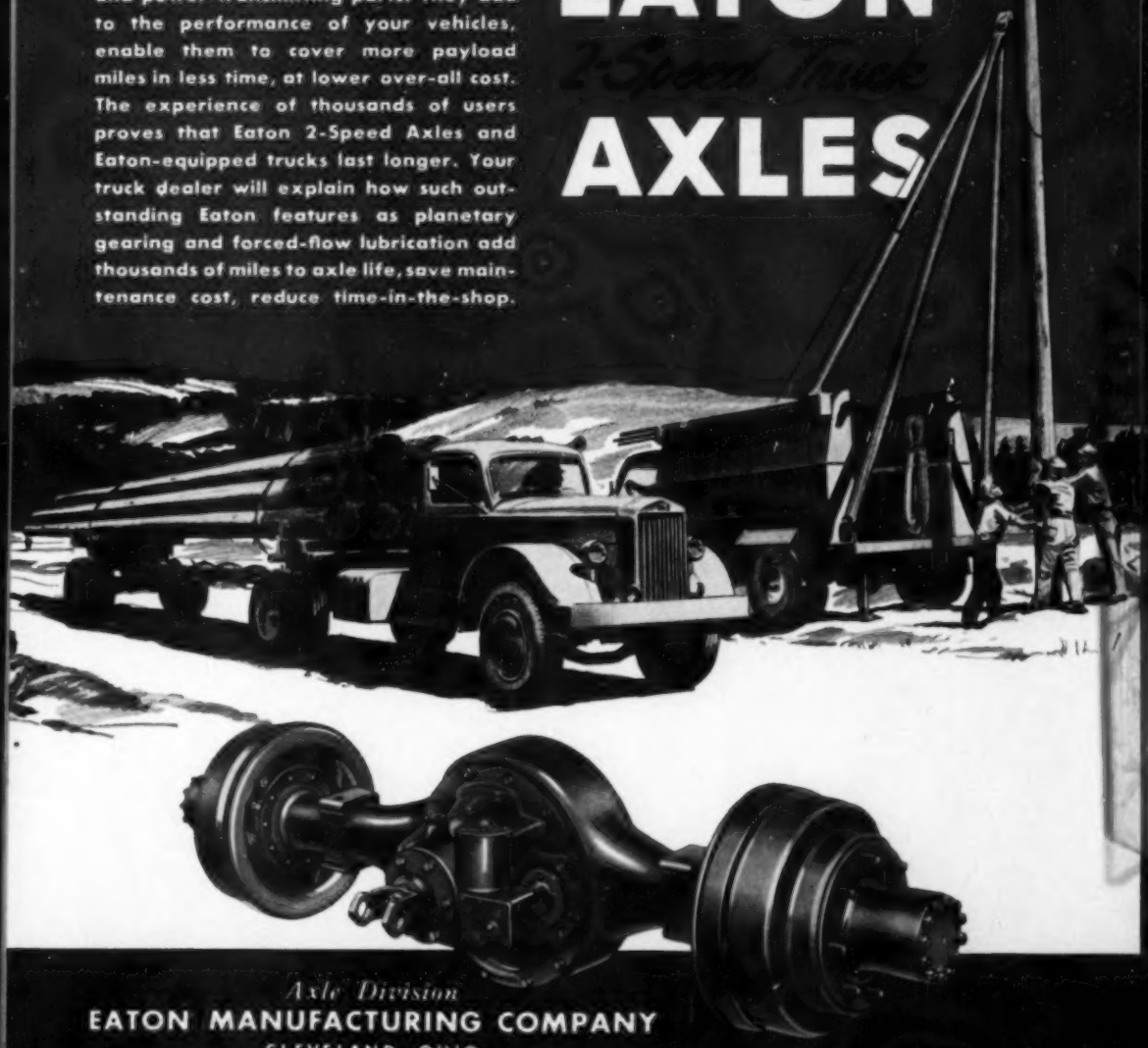
ESTABLISHED 1890

221 WEST THIRD STREET, CINCINNATI 2, OHIO

On the Highway or Off—
Trucks Go Faster at Lower Cost

Eaton 2-Speed Axles enable your trucks to go where they have to go to do the job—without damaging strain on engine and power-transmitting parts. They add to the performance of your vehicles, enable them to cover more payload miles in less time, at lower over-all cost. The experience of thousands of users proves that Eaton 2-Speed Axles and Eaton-equipped trucks last longer. Your truck dealer will explain how such outstanding Eaton features as planetary gearing and forced-flow lubrication add thousands of miles to axle life, save maintenance cost, reduce time-in-the-shop.

EATON
2-Speed Truck
AXLES



Axle Division

EATON MANUFACTURING COMPANY

CLEVELAND, OHIO

PRODUCTS: SODIUM COOLED, POPPET, AND FREE VALVES • TAPPETS • HYDRAULIC VALVE LIFTERS • VALVE SEAT INSERTS • JET ENGINE PARTS • ROTOR PUMPS • MOTOR TRUCK AXLES • PERMANENT-MOLD GRAY IRON CASTINGS • HEATER-DEFROSTER UNITS • SNAP RINGS SPRINGTITES • SPRING WASHERS • COLD DRAWN STEEL • STAMPINGS • LEAF AND COIL SPRINGS • DYNAMATIC DRIVES, BRAKES, DYNAMOMETERS

IT'S NO TRICK TO RE-ORDER BOWDIL BITS..

1. PLACE YOUR TYPE BIT ON THESE ACTUAL SIZE LINE DRAWINGS.
2. IT'S EASY THEN TO ORDER BY NUMBER.

Designed especially for specific coal cutting requirements, made from special alloy steel, heat treated to a variety of hardnesses, these bits are available in special shapes, contours of the cutting face, and clearance angles. Bowdil Bits are the result of many years of research on actual cutting conditions in the field by the Bowdil Company.

► The **1-1 DIAMOND BIT**, designed for use where the cutting conditions are not too severe, saves power and produces larger slack.

► The **1-2 DIAMOND BIT**, designed along the same lines as the 1-1, is especially adapted for severe cutting (Iron Pyrites and Rock).

► The **1-6 LONGWALL BIT** is especially designed with a long cutting point for Longwall work.

► The **1-11 CONCAVE BIT** is designed for even greater power savings. This bit has a narrow cutting face and special side clearance which becomes greater as the cutting point wears away. The result is a more uniform power consumption over the full life of the Bit.

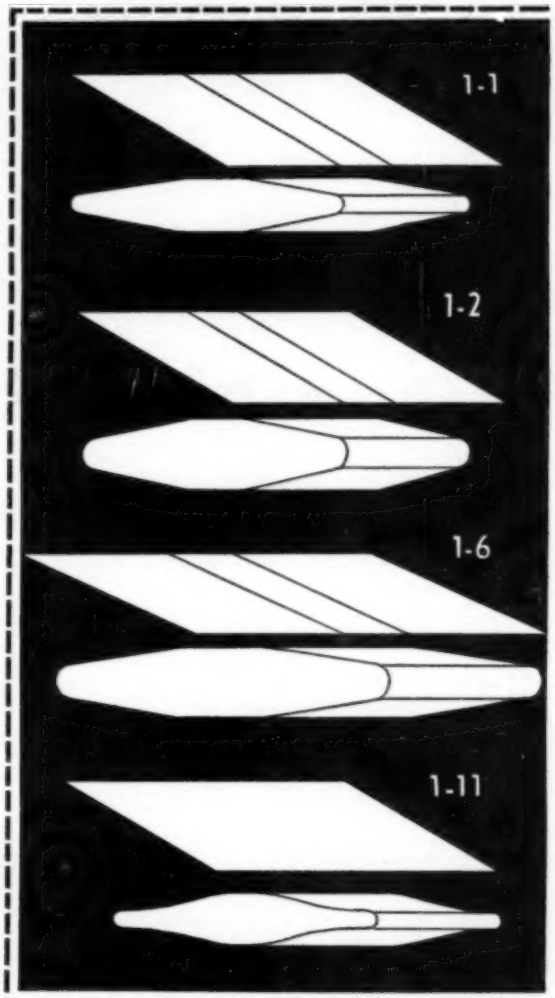
• • • • • • • • • • • • • • • • •

COUNT ON LOWER OPERATING COSTS WITH BOWDIL FABRI-FORGED CHAIN

This Bowdil design is rugged and easy to maintain. Drop-forged lug body stands up under heavy wear, breakage practically eliminated. A major improvement is the true-running radial track guide.

DESIGNED FOR EXTRA STRENGTH AND POWER SAVING . . . BOWDIL CUTTER BARS

have rivet-free bodies, z bar construction and wide wearing strips . . . the sturdiest bar in mining. Bowdil Cutter Bars are standardized to fit all coal cutting machines.



The BOWDIL COMPANY ~ CANTON, OHIO

"Tycol Acylkup boosts bearing life... smooths the way for heavier loads"

Of course! Tycol Acylkup Bearing Grease "stays put" . . . keeps anti-friction bearings running smooth and cool. Finest quality neutral oils give it high load-carrying capacities. Tycol Acylkup is firmly resistant to the washing action of water. Its dependable lubricating abilities lengthen bearing life and reduce maintenance costs. Call your nearest Tide Water Associated office for further information.

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TIDE WATER ASSOCIATED OIL COMPANY

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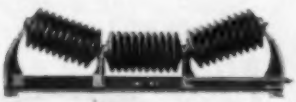
SEND FOR A FREE COPY OF "TIDE WATER ASSOCIATED LUBRICANIA"

THERE'S A ..... Continental IDLER for every purpose

STANDARD DUTY IDLER



RUBBER DISC IMPACT IDLER

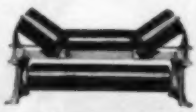
SELF-ALIGNING TROUGHING IDLER

SELF-ALIGNING FLAT BELT IDLER

FLAT BELT IDLER

HEAVY DUTY IDLER

PICKING TABLE IDLER



GRAIN CONCENTRATOR IDLER

GRAIN FLAT BELT IDLER

UNIT STAND IDLER

Specify CONTINENTAL .....

Belt conveyors are used for handling many types of material. For this reason, Continental manufactures a variety of Idlers, each designed to best take care of a particular application.

When ordering your next Belt Conveyor, specify Continental Idlers and take advantage of their complete line.

Most standard size Idlers can be shipped FROM STOCK. Other sizes can be shipped promptly.

INDUSTRIAL DIVISION

CONTINENTAL GIN COMPANY

BIRMINGHAM, ALABAMA

ENGINEERS CGC ATLANTA • DALLAS • MEMPHIS • NEW YORK CGC MANUFACTURERS

TAKES HEAVY IMPACT

LIKE A POOL TAKES A PEBBLE

Homocord CONVEYOR BELT

"We seldom see a cut or gouge in Homocord Conveyor Belts. And they consistently outlast other belts on heavy-duty installations."

There are engineering reasons for this typical user report. The extra body-cushion built into Homocord dissipates the shock of sharp impact from large lumps of coal, ore and rock . . . assures long life. Natural troughing and flexibility add up to more ton-miles of materials carried.

Full description of these and other advantages are described in Bulletin 6906. Let us send you a copy. You get the same long-life engineering in R/M hose, V-belts and flat belting. Ask your R/M representative.

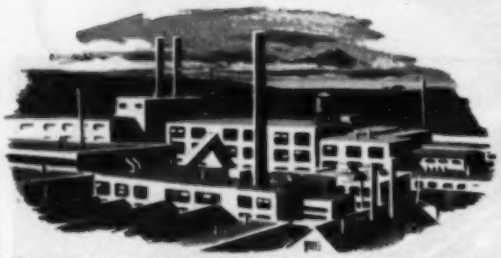
MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Manufacturers of Mechanical Rubber Products • Rubber Covered Equipment • Radiator Hose • Fan Belts • Brake Linings • Brake Blocks • Clutch Facings • Packings • Asbestos Textiles • Powdered Metal Products • Abrasive and Diamond Wheels • Bowling Balls

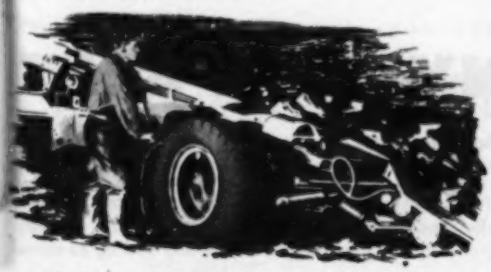
From one Main Street to another the story's the same! Actually almost everything this country produces requires coal—coal to make steel, to run factories and railroads, to generate immense quantities of electric power, to heat stores, hospitals, apartments. And perhaps *your home* is one of the 14 million that rely on the steady, healthful heat that bituminous coal provides!

From East Side to West Side... your town takes a lot of Coal!



This factory is typical of the thousands of plants that turn out everything America needs. It gets its power from coal—America's #1 steam fuel—for coal is practically everywhere the most economical power source. And today, automatic controls, automatic coal and ash handling apparatus net even larger savings—minimize dramatically the inconveniences associated with older installations.

From periscope to keel it took 800 *tons* of coal to make the steel that went into this submarine! Today more and more coal is needed for national defense. However, thanks to America's vast coal reserves and the great degree of mechanization that progressive mine operators have developed in mining and preparing coal—*rearmament will get all the coal required without any pinch on the home front!*



Highly developed machines like the giant loader above have made it possible for the American miner to reach a daily output that's 4 to 24 times that of any miner in Europe or Asia. Today, the American miner is actually a skilled machine operator. Fully 98% of all American coal is mechanically cut —about 75% mechanically loaded.

In their constant search for a better and more economical coal product the managers of this country's 8,000 mines have invested hundreds of millions of dollars in research—in modern machinery—in finding and developing new mine properties. As a result, today's output per man in America's coal mines is more than 32% greater than in 1939—one of the greatest efficiency gains in American industry. *This nation can count on her privately managed coal companies for all the coal it needs to stay strong—to become stronger!*

BITUMINOUS COAL INSTITUTE
A DEPARTMENT OF NATIONAL COAL ASSOCIATION
WASHINGTON, D. C.

FOR NATIONAL DEFENSE
FOR PEACETIME PROGRESS ***YOU CAN COUNT ON COAL!***

Fast worker — reliable, too! This "Caterpillar" Diesel No. 12 Motor Grader is used by H. J. Williams, York, Pa., for maintaining roads on coal-stripping operations near Saxton. An essential tool in mining, it stands up under tough going—handles easily. As a military tool, it's essential for airport construction and maintenance, road construction, the establishment of bases and scores of other earthmoving jobs.

HOW TO GET MORE WORK FROM YOUR "CAT" MOTOR GRADER!

You're the Doctor

Preventive maintenance is good medicine for long life. Your Operator's Instruction Book is invaluable in the fight to conserve machine life. Follow the operation, lubrication and maintenance recommendations. When wear is evidenced in cutting edges, gears, tires or engines, see your "Caterpillar" dealer. He can help you prolong the life of your motor grader. Your motor grader is essential—don't abuse it.

OUR COUNTRY'S defense needs have stepped up the demand for coal. Among the factors that help speed coal-stripping operations are good haul roads. To build, maintain and extend them, the "Caterpillar" Motor Grader has proved itself the No. 1 tool.

The speed, versatility and big work capacity that have made this machine essential to coal stripping have also made it essential to our armed forces. As military orders get first call, you may not be able to obtain prompt delivery of new machines. So it will pay you to plan now to get more work from your present equipment.

"Cat" Motor Graders are ruggedly built for long life. But good care on your part can lengthen that life span by thousands of extra service hours. Here's how:

1. **Follow the recommended *operating* care in your Operator's Instruction Book. Read and reread it.**
2. **Observe the *maintenance* suggestions in the Operator's Instruction Book. They're down-to-earth—experience has proved them practical and effective.**
3. **Anticipate your future replacement parts needs by seeing your "Caterpillar" dealer about them *now*. Don't wait until wear gets beyond repair—many a part can be rebuilt *if* serviced in time.**

You're in good hands when you work closely with your "Caterpillar" dealer. He is anxious to help you solve your problems. His service staff, service trucks and service facilities are ready to help you lick them.

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

CATERPILLAR

DIESEL ENGINES • TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT

YARDLEY M-1 *Flexible* PLASTIC PIPE

End corrosion troubles for good. Use this tested plastic pipe that is resistant to acids and alkali. It is light, flexible and tough . . . withstands normal operating pressures and temperatures . . . cuts installation costs up to 60% . . . requires minimum maintenance.

Yardley M-1 pipe comes ready to use with accessories illustrated. Sleeve-type outside couplings quickly attached with stainless steel clamps. Warehouse stocks near most mining areas.

Illustration shows a 200-ft. coil of 2" pipe. Approximate weight, 90 lbs.

Made in 9 sizes...

Plastic M-1 pipe comes in standard iron pipe sizes: ½, ¾, 1, 1¼, 1½, 2, 3, 4 and 6 inches. Sizes through 3" are coiled; 4" and 6" in straight lengths.

Write us for nearest distributor.

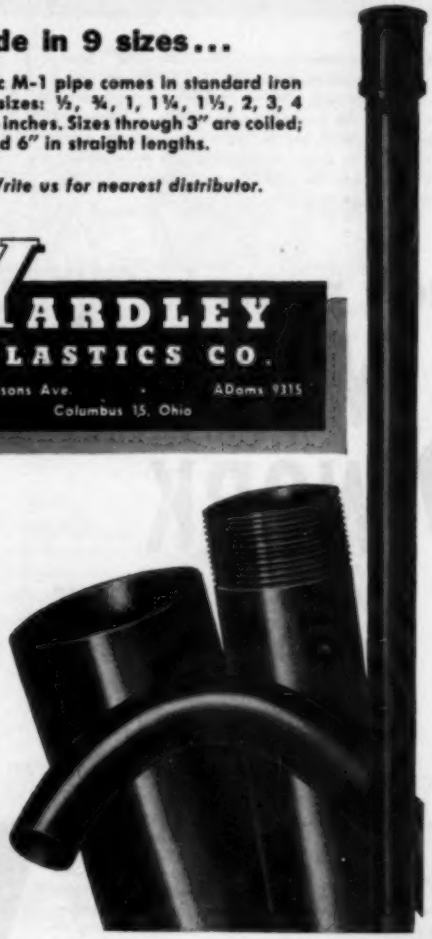
YARDLEY PLASTICS CO.
142 Parsons Ave. • ADams 9315
Columbus 15, Ohio

INSERT COUPLING

INSERT ADAPTER

ELBOW

TEE



Other Yardley Plastic Pipe ▶ ▶ ▶

M-4
A heavy-duty flexible pipe similar to M-1 for high-pressure, suction and pumping applications.

M-3
A light-wall, rigid plastic pipe with cement-type fittings and thread adapter.

M-3-S
Similar to M-3 with heavier wall in standard iron pipe sizes, threaded and coupled. Complete line of plastic fittings.

LESS DOWNTIME *for Tire Changes*
LESS UPKEEP *for Tire Repairs*
LESS OUTLAY *for Tire Replacements*

It's a Fact... It Costs You Less to Run

Firestone
OFF-THE-HIGHWAY TIRES

IT COSTS you less to run Firestone Tires because their treads are extra tough to withstand cutting and abrasion, extra thick to deliver more miles of service. And, whether your work is in sharp rock, loose earth or slippery clay, Firestone Tires have treads especially designed to meet your particular requirements.

It costs you less to run Firestone Tires because their extra-strong Gum-Dipped rayon cord bodies are the next thing to trouble-free. Protected against impact by four special tread plies and guarded against cuts and snags by double-thick sidewalls, they run longer without interruption, remain in better condition for additional retreading.

Firestone Tires cost you no more to buy than other popular makes, cost a considerable amount less to run. Make a note now to buy your next tires from your nearby Firestone Headquarters.

. Enjoy the Voice of Firestone on radio or television every Monday evening over NBC .

Copyright, 1951, The Firestone Tire & Rubber Co.

PRIMACORD produces a powerful detonating wave which travels at approximately 4 miles per second throughout its length. It acts as the detonating agent for all holes in the shot.

The infinitesimal time lag between holes and rows of holes permits planned rotation firing, relieves burden. The powerful detonation of each portion of each charge produces more work from your explosives.

Primacord is insensitive to stray electrical currents —cannot be set off by friction, sparks or ordinary shock.

Add to this the ease of handling, simplicity of hook-up, and high tensile strength . . . you'll see why it is the almost universal choice of stripping men.

WIRE COUNTERED PRIMACORD. Armored with closely stranded brass wire, Wire Countered Primacord is the answer where deep, ragged holes and high abrasive conditions are encountered. The wire sheath increases tensile strength to 220 lbs. Weight per 1000-foot spool is 35 lbs.

PLASTIC REINFORCED PRIMACORD. Use it for extremely deep, wet holes, river crossings, or wherever water is a problem. It is also resistant to acids commonly encountered. Although Plastic Reinforced Primacord weighs only 22 lbs. per 1000-foot spool, its tensile strength is 250 lbs.

REINFORCED PRIMACORD. Depend on it for use in deep holes where extra tensile strength (160 lbs.) or resistance to abrasion are desirable. Tough, but resilient and easy to handle, it is gaining in popularity for general use. 1000-foot spool weighs 20 lbs.; tensile strength 160 lbs.

PLAIN PRIMACORD. For shallow holes, surface trunkline use and other applications where abrasive and other rugged conditions are not considerations. 1000-foot spool weighs 19 lbs., tensile strength 113 lbs. P-55

Users of Primacord agree that there is no substitute for its general excellence. Consult your explosives supplier for complete information, or write to us direct.

THE ENSIGN-BICKFORD COMPANY
Simsbury, Connecticut

PRIMACORD®-BICKFORD

DETONATING FUSE

Also Ensign-Bickford Safety Fuse — Since 1836

Devoted to the Operating, Technical and Business Problems of the Coal-Mining Industry

Coal Age

OCTOBER, 1951

IVAN A. GIVEN, EDITOR

The Tide in Coal

ESTIMATED bituminous production for the first 30 weeks of 1951, 296,387,000 tons. Expected production for the year, 540,000,000 tons or more. Average for the five prewar years (1937-41), 432,770,000 tons. Estimated anthracite production for the first 30 weeks of 1951, 22,336,000 tons. Expected production for the year, around 44,000,000 tons. Average, 1937-41, 51,459,000 tons.

As 1951 rolls along, it becomes increasingly apparent that it is going to be a good year for bituminous. Even more important, all the evidence indicates that it has reached a new high level in production, with good prospects for the future. Anthracite presents an apparently opposite picture. It has been a major target not only of oil and gas but also bituminous coal and coke, and has suffered greatly from warm weather. So there is reason for contending that its showing is not bad, and that it has reached a point where, if it cannot begin to build immediately, it can hold until that time comes.

Representing a new large-tonnage market, the new Texas plant of the Aluminum Co. of America is scheduled to use lignite. And new ram jet engines for aircraft, it is reported, can use any fuel, including, if desired, powdered coal.

As the need for energy—at a reasonable cost—climbs in the United States, coal's potential looms larger and larger, not only for such new products as synthetic liquid fuel but for direct use in solid form. Competition is tough and will stay tough, but that fact should not prevent appraising future possibilities and preparing to cash in on them.

Western States Fuel Policy Council, organized by western operators and allied interests, including the United Mine Workers, slows down and may stop plans to import natural gas into Montana from Canada.

Joint action is not the sole and simple answer to the problem of meeting competition. However, joint action, based on a definite program and carried forward vigorously, can tip the scales often enough to make it worth the effort. And as victories are won, others come easier. This works not only in meeting competition but in research, merchandising, government and union relations, the establishment of a realistic fuels policy, or any other industry-wide problem that needs to be solved.

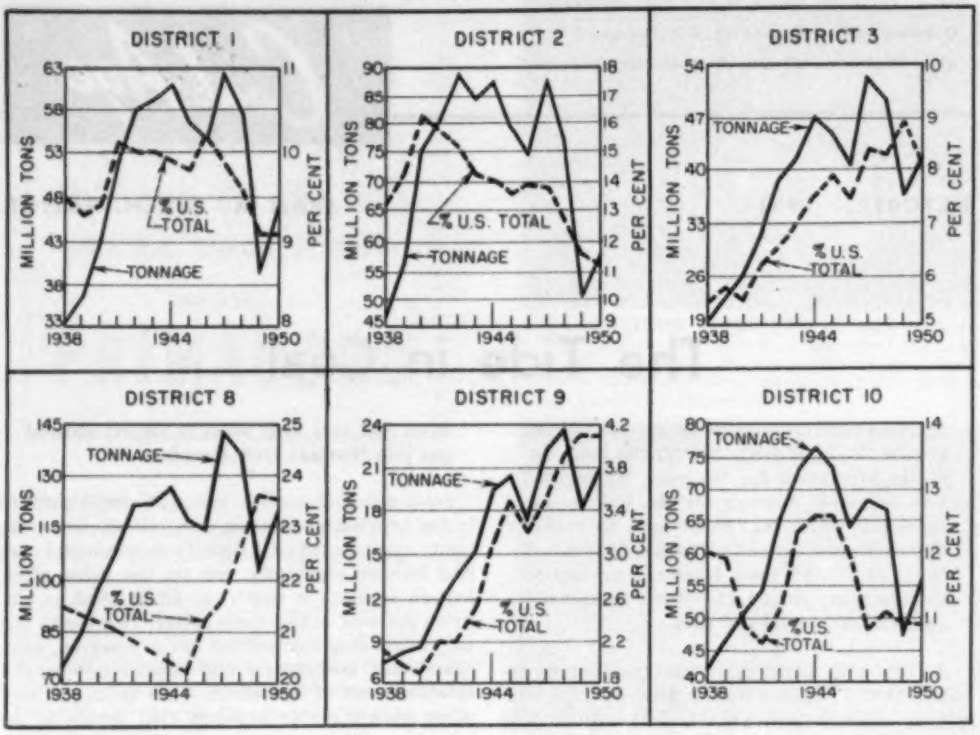
Concentration on service improvements largely responsible for raising output per loading unit 90 tons at King mine, Utah. New Georgetown plant, in Ohio, epitomizes advances in the preparation of a fuel better suited to the needs of the consumer.

The battle plan for the coal industry has always, of necessity, included efficiency in production and preparation. Money must be spent for equipment and managerial talent and time must be devoted to making sure that that equipment—and the manpower necessary for its functioning—yield the maximum in returns. Management must especially guard against the assumption that things are pretty well set and no further advances are possible. There is no greater bar to progress.

★ ★ ★

For the fighting coal man—executive, production or sales—the future is nothing to be downhearted about. In fact, it is beginning to shape up more and more as an opportunity for greater progress through better service based on an abundant supply of quality fuel priced to give the consumer the most for his money.

How the Big Ten Bituminous Districts Have Fared Productionwise



Who Mines Coal—And Where

Ten-Year Trends in Bituminous and Anthracite Show:

How the Big Companies Fare — **How the Captive Group Changes**

How Small Outfits Grow — **Why and How Stripping Spreads**

Which Districts Are Gaining — **How Competition Spurs Growth**

Why Coal Still Is a Free-Enterprise Industry

WHO MINES COAL? And where?

How do coal companies grow?

Is stripping here to stay?

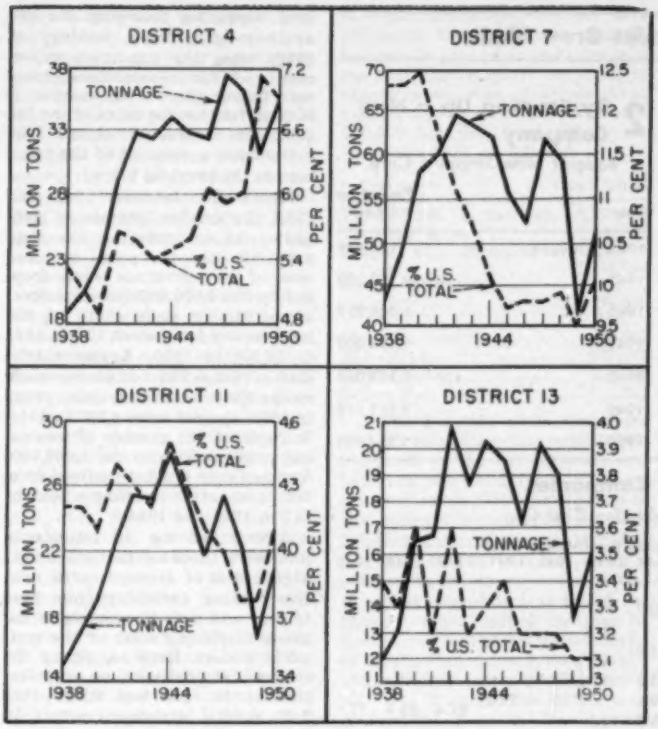
What about "captive" production?

Is there a trend toward centralization or monopoly in coal?

The answers to these and other questions about coal lie in the directions the industry has taken in the last 10 yr and more. The trends that take shape from the facts provide coal men, as well as customers in search of fuel and investors in search of sound enterprises, with signposts for the years ahead.

TABLE I—How 1950 Bituminous Production Was Spread Among Tonnage Groups

Tonnage Bracket	Number of Producing Groups	Production	Percent of Total
Over 3,000,000	27	181,962,000	35.5
2- to 3,000,000	15	36,623,000	7.1
1- to 2,000,000	43	60,666,000	11.9
700- to 1,000,000	45	38,074,000	7.4
500- to 700,000	47	28,178,000	5.5
400- to 500,000	33	14,620,000	2.9
300- to 400,000	50	17,435,000	3.4
200- to 300,000	75	18,258,000	3.6
100- to 200,000	222	31,699,000	6.2
Under 100,000	6,926	84,513,000	16.5



In brief, the answers to the questions above are as follows:

1. Among the 23 bituminous-producing districts, and even among the top 10 districts, there are areas of growth and areas of decline. Company-wise, there are growth opportunities in the top ranks as well as among the smaller producers.

In anthracite, the shift of production is to the southern field. On a company basis, since the industry is smaller and its markets are less diversified, growth opportunities are somewhat narrower than in bituminous.

2. Coal stays alert and on the move because competition is lively and new blood flows steadily into the industry, especially in bituminous.

3. Companies grow by opening properties to serve new-won markets, by competing successfully against other companies for existing markets and, especially in bituminous, by merger and consolidation.

4. In anthracite and bituminous, stripping is growing year by year, offsetting the higher costs of deep mining and adding an element of stability to both industries.

5. Though captive tonnage holds fairly steady in relation to total production, there are shifts within the captive group, notably the loss of railroad tonnage and the increase in electric-utility consumption.

6. In bituminous, there now are fewer big companies than in 1941 and their share of the total market is less than it was 10 yr ago. In contrast, the number of small companies is higher, as is their percentage of the market. In anthracite, the top eight producing companies since 1941 have gained a bigger share of the total market.

The above conclusions are the highlights that show up out of the past decade and more.

How Companies Fare In Bituminous

THE FRAMEWORK OF THE BITUMINOUS INDUSTRY is small business, lively competition and free enterprise. It is doubtful that any other industry with comparable unit volume (512,000,000 tons in 1950), dollar value of product ($2,000,000,000 plus) and number of employees (430,000) is so spurred by individual initiative, freedom from centralized control and opportunity to grow.

In 1950, for example, bituminous production was widely spread among big, middle-size and small companies, according to *Keystone Coal Buyers Manual*. As Table I shows, the tonnage produced by the 7,306 small companies turning out less than 500,000 tons per year nearly matched the output of the 3,000,000-tons-and-over group. In fact, the share of the total market held by the 1,000,000-tons-and-over organizations dropped each year between 1941, when it was 61.2% of the total, and 1949, when it was down to 50.5%. The increase from 50.5% in 1949 to 54.5% in 1950 reflects the partial recovery of the big union-

TABLE II—How the Top 10 Commercial Producers of Bituminous Ranked, 1941-1950

Company	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950
Pittsburgh Coal Co.	3	4	5	5	1					
Consolidation Coal Co.	5	5	4	4		1	1	1	1	1
Hanna Coal group	..	10	..	..	..					
Peabody Coal group	2	2	1	1	2	2	3	2	2	2
Eastern Gas & Fuel Associates	1	1	2	2	3	3	2	3	3	3
Island Creek group	4	3	3	3	4	4	4	4	4	4
Truax-Traer Coal Co.	10	..	..	..	10	8	8	6	7	5
Pittston group	..	..	..	..	..	..	9	9	6	6
Old Ben group	..	9	9	9	5	6	5	5	8	7
Berwind-White group	6	7	7	7	7	7	7	8	9	8
Sinclair organization	..	..	..	..	..	10	..	..	5	9
Rochester & Pittsburgh Coal Co.	8	8	8	8	8	9	10	10	..	10
West Kentucky Coal Co.	..	..	..	..	..	..	..	..	10	..
Pocahontas group	7	6	6	6	6	5	6	7	..	..
Chicago, Wilmington & Franklin Coal Co.	..	..	10	10	9	..	..	..	..	..
Stonega Coke & Coal group	9	..	..	..	..	..	..	..	..	..

How Coal Companies Grow Bigger

1 By Climbing Up From Lower Brackets

West Kentucky Coal Co.

Year	Production (Tons)	Rank Among Commercial Producers
1941	1,677,196	48
1942	2,552,690	33
1943	2,718,244	36
1944	3,091,246	31
1945	3,390,281	22
1946	3,661,945	14
1947	4,427,779	13
1948	4,499,542	12
1949	4,345,001	10
1950	4,549,250	12

2 By Starting Up a New Company

Badgett Mine Stripping Corp.

Year	Production (Tons)
1944 (first year)	159,307
1945	Under 100,000
1946	1,064,957
1947	1,154,000
1948	1,397,049
1949	1,217,118
1950	1,254,794

3 By Merging Established Companies

Pittsburgh Consolidation Coal Co.

Company	Production (Million Tons) 1941	1942	1943	1944	1945	1946	1947	1948	1949	1950
Pittsburgh	9.7	10.7	10.0	10.5	10.3	22.1	27.3	27.4	23.4	27.1
Clover Splint	0.4	0.4	0.4							
Consolidation (Pa.)	1.0	1.0	0.9	1.8						
Union Collieries	2.1	2.2	1.4							
Consolidation (Ky.)	2.9	2.9	2.9	3.2	3.0					
Consolidation (Md.)	0.4	0.4	0.4	0.1	...					
Consolidation (W.Va.)	5.0	6.0	4.7	5.9	5.2					
Hanna	3.4	5.3	5.4	5.9	4.8					
Jefferson	0.8									
Christopher	4.0	4.5	4.4	4.1	3.5	2.9				
Pursglove	1.4	1.3	0.7	0.9	0.8	0.8				
Cadiz	...	...	...	...	...	...	0.1			

4 By Finding New Markets and Opening New Mines Close to Profitable Markets

Sinclair Coal Co.

Company	Production (1,000 Tons)* 1941	1942	1943	1944	1945	1946	1947	1948	1949	1950
Bevier	(370)	(508)	(695)	(615)	(476)	(464)	313	821	790	585
Broken Arc	....	....	....	....	....	....	234	468	439	377
Eagle-Cherokee	....	(204)	(191)	(232)	(203)	189	181	137	126	97
Homestead	....	....	....	278	456	546	959	1,472	1,865	1,699
Hume-Sinclair	735	719	645	1,118	920	947	978	974	1,020	904
Huntsville-Sinclair	421	442	497	470	417	429	413	462	426	475
Key	....	....	....	....	....	....	....	17	255	422
Marigold	150	176	145	190	119	130	148	125	100	68
Pershing	....	....	....	....	(115)	....	....	....	130	265
Wickliffe	(332)	(453)	(485)	(598)	(660)	(529)	(591)	(476)	240	211
Rogers County	....	....	....	....	....	....	....	....	....	199
Old Mac	....	....	....	....	....	98	314	289	76	....
Sooner	....	....	(267)	291	261	243	302	239	113	....
Sentry	1,074	977	922	1,067	1,190	223	367	....	....	....
Seneca	480	691	694	634	593	409	87	....	....	....
Delta	533	590	583	600	597	377	(575)	(527)	(396)	(424)

* Where production prior to Sinclair control was less than 100,000 tons, yearly totals have been omitted.
() Not owned by Sinclair in these years.

ized companies following the off-again-on-again labor strategy of 1949, when the non-union mines, mostly smaller organizations, picked up a bigger share of the market. It is doubtful that the gains of the big companies between 1949 and 1950 foreshadow a reversal of the trend seen in the previous 9 yrs.

Meanwhile, between 1941 and 1950, the smaller bituminous companies—those producing less than 1,000,000 tons per year—captured most of the percentage points dropped by the 1,000,000-tons-plus operators, raising their share of the total market from about 10% in 1941 to 16.5% in 1950. *Keystone* estimates that 6,926 companies made up the 100,000-tons-and-under group in 1950, against some 4,300 in 1941. In contrast, the number of producing organizations in the 1,000,000-tons-and-over bracket declined from 106 to 85, after reaching a peak of 117 in 1943 and 1944.

Among the top 10 bituminous producers, there has been since 1941 a good deal of ferment, with relative ranking switching from year to year and with newcomers to the group displacing some of the erstwhile leaders. Even so, among the commercial producers, no organization up to 1945 had mined over 2.6% of total bituminous output. In that year, with the formation by merger of Pittsburgh Consolidation Coal Co., a commercial organization for the first time produced as much as 4% of the total. In 1948, with 4.5% of the total, Pittsburgh Consolidation squeezed out the captive operations of U. S. Steel Co. for top place among all producers and, in 1949 and 1950, tightened its hold on top place by mining 4.9% of the total.

The captives of U. S. Steel, which had mined 4.6 to 5.1% of the total from 1941 through 1945, produced 4.5% in 1948, 4.4% in 1949 and 4.3% in 1950, holding a consistent second place after 1947. The other leading captives, operated by Bethlehem Steel, held seventh place from 1941 through 1944, moved up to sixth in 1945, dropped back to seventh in 1946 and 1947, regained sixth in 1948, captured fifth place in 1949 and finished the 10-yr period in 1950 in sixth place.

Eliminating the captives, Table II shows how the rankings among commercial producers have changed since 1941. The four top places, with very few exchanges of rank, have been held consistently by the Peabody group, Eastern Gas & Fuel Associates, the Island Creek group, and the Pittsburgh Consolidation

organization and its major pre-merger components.

Below fourth place among the commercial producers, there has been more activity. The Pocahontas group, for instance, having held fifth, sixth or seventh place up through 1948, disappeared from among the top 10 in 1949, and the Chicago, Wilmington & Franklin Coal Co., which held ninth or tenth place from 1943 through 1945, dropped out of the top 10 after 1945.

Meanwhile, new names moved in among the leading 10 commercial producers, Truax-Traer Coal Co., which ranked tenth in 1941, thirteenth in 1942 and twelfth in 1943 and 1944, recaptured tenth place in 1945 and since then has moved up to fifth place in 1950. The Pittston group of companies, which first entered the top 10 in 1947 in ninth place, took over sixth place in 1949 and 1950. And the Sinclair Coal Co. properties, which first showed up among the leading 10 in 1946 but dropped out in 1947 and 1948, captured fifth place in 1949 and ninth place in 1950.

Newest entrant among the big 10 is West Kentucky Coal Co., which moved into tenth place in 1949. This upcoming organization will bear watching. With new atomic-energy plants going up near by and with other industrial developments scheduled in or near the West Kentucky field, the company stands a good chance of pushing forward in the years ahead.

Although the Big 10 producers have mined sizable tonnages, their output never has been high enough to control bituminous markets or to create even a threat of monopoly. They have not produced over 17.9% of total bituminous tonnage in any year since 1941. They reached that figure in 1950. In earlier years, their percentage ranged from 15.4 to 17.3% of the total.

What has happened to the smaller companies in the meantime?

Some of them, betting on a long shot or entering the industry in the hope of cashing in on a passing crisis, have abandoned their little properties after a short life. Others, by purchase or merger, have lost their identities in larger outfits. Still others, by virtue of enterprising management and bold risk-taking, have grown into substantial companies and taken their place among established producers.

This last group—the new but solid and well-managed companies—has provided a steady upward seepage of new blood into the ranks of established producers. They have refreshed the industry's outlook, brought in new ideas and sustained the competitive spirit. In 1950, to take only one year, *Keystone* listed eight companies that produced over 500,000 tons but were not in existence in 1941, as follows:

Company	1950 Output
Kaiser Steel Co. captives	1,898,408
Terteling Bros.	1,444,242
Badgett Mine Stripping Corp.	1,252,794
Pursglove Coal Service Corp.	794,675
Magnolia Coal Co.	699,697
Ken Coal Co.	672,357
L. E. Cleghorn	525,823
Bitner Fuel Co.	503,517

In other words, while companies that already were big moved into the ranks of the top 10 producers, bringing new blood, fresh ideas and renewed competition, newcomers to the industry moved into the 500,000-tons-and-over class, bringing the same stimuli to their brackets.

Thus, in an atmosphere of initiative, free competition and bold enterprise, opportunities continue to beckon coal companies toward higher levels. Companies have grown—and will grow in the years ahead—without, it should be noted, any government help—in four not-so-different ways:

1. By climbing up from lower brackets as, for instance, Truax-Traer and West Kentucky did over a 10-yr period.

2. By forming new companies and pushing up from scratch, as did Terteling Bros., Inc., and Badgett Mine Stripping Corp., to mention only two.

3. By merging established companies, as did Pittsburgh Consolidation Coal Co. and the Pittston group, for example.

4. By opening new properties close to growing markets and adding them to a string of mines already operating, as the Sinclair group did, to mention only one.

What's Happened Among the Captives

CAPTIVE TONNAGE, as pointed out earlier, has ranged narrowly from 15.5 to 17.5% of total bituminous output since 1941. Tonnage-wise, the top figure was 106,104,000 tons in 1944, the peak year of World War II. The low year was 1949, when three-day weeks and outright stoppages dragged the entire industry down to a postwar low.

The number of steel companies mining their own coal has held pretty steady at 17 to 20. In other industries with captive mines, however, there have been ups and downs. In 1943, for instance, 15 railroads mining fuel for their locomotives turned out 23,482,000 tons. By 1950, the number of railroads mining coal had fallen to 11 and their total output was only 12,755,000 tons. The trend reflects the increasing use of diesel locomotives.

Utilities, on the other hand, have shown increasing activity in coal mining. In 1942, only seven utilities mined their own coal, producing 5,272,000 tons. In 1950, 12 utilities owned and operated their own mines and produced 8,895,000 tons, an increase of over 68%. Big newcomers to this field include Union Electric Co., in 1949, and American Gas & Electric, in 1950.

A captive activity to watch is chemicals, a growing industry that may be destined to play the same coal-using role in the future that the electric utilities now are playing. In 1947, only three chemical companies owned and operated their own mines. By 1950, the number had grown to five, with total output of 2,623,000 tons. Though the tonnage still is negligible, the potential is great. Most recent entrant in this field is Southern Alkali Corp., which in 1951 took over mining properties from Pittsburgh Plate Glass Co.

How District Trends Shape Up

GEOGRAPHICALLY, bituminous production shows a checkered pattern, with a few districts holding their own fairly well, others declining in importance and still others growing.

As a yardstick, take the 2-yr period 1938-39, a slow year followed by the first year of prewar defense activity, and compare it with the most recent 2-yr period (1949-50), again a bad year followed by a defense build-up. From the earlier 2-yr period to the more recent one, bituminous production increased 27.5%. Thus, to hold its own in the national market, a district would have to boost its production similarly.

Following the national trend fairly closely, District 1, Central Pennsylvania, increased its production 22.8%, thus losing little of its approximately 9% share of the

market. District 13 (the Southeast), and District 14 (Arkansas and Oklahoma), upped their production about 20%, losing only a little more than District 1 lost.

Substantial losers between the two 2-yr periods were District 10 (Illinois), which increased its tonnage only 13.6% and thus dropped from 12% of the total market to 10.9%; District 11 (Indiana), which mined 15.6% more coal but dropped from 4.3% of the national market to 3.9%; and District 2 (Western Pennsylvania), which boosted its tonnage only 3.8% and dropped from 14 to 11.4% of total nation-wide output. In Districts 10 and 11, spreading natural-gas pipelines was probably the biggest obstacle. In District 2, it was cheap residual oil, most of it imported.

The biggest losses between the two 2-yr periods were, on the whole, in the low-tonnage districts. For instance, production in District 12 (Iowa), dropped 36.6% and that district's share in total bituminous output fell from 0.8 to 0.4%. Much the same decline occurred in District 15 (the Southwest), with production down 11%; Districts 16 and 17 (Colorado), down 45 and 6% respectively; District 18 (New Mexico), down 73%; and Districts 22 and 23 (Montana and Washington-Alaska), down 4.5 and 28% respectively.

The big gains tonnage-wise between 1938-39 and 1949-50 show up in Districts 3 (Northern West Virginia), 4 (Ohio), 8 (Southern High-Volatile) and 9 (West Kentucky). Averaging the two bienniums, District 8 increased its output from 79,348,000 tons in 1938-39 to 111,620,000 tons in 1949-50, a boost of 42.1%; District 3, from 20,930,000 to 34,140,000 tons, up 87%; District 4, from 19,440,000 to 33,123,000 tons, up 70.4%; and District 9, from 7,829,000 to 19,500,000 tons, up 149.1%.

At the same time, these growing districts increased their respective shares of the total nation-wide output. District 3, which produced 5.6% of the nation's tonnage in 1938-39, boosted its share to 7.7% in 1949-50; District 4, from 5.2% in 1938-39 to 6.6% in 1949-50; District 8, from 21.4 to 22.2%; and District 9, from 2 to 3.8%.

Percentage-wise, two of the smaller districts made substantial gains, though their tonnage was small. District 20 (Utah) raised production from a 1938-39 average of 3,100,000 tons to a 1949-50 average of 6,200,000, an even 100% that was attributable almost entirely to the opening of mines to supply Kaiser Steel Co. District 21 (North and South Dakota) in the same period increased its output from 2,100,000 to 3,110,000 tons, up 48%, mostly because of Truax-Traer's expanded production of lignite.

Bituminous Stripping Gains Strength

BITUMINOUS STRIPPING produced only 8.7% of the Nation's total in 1938. By 1950, this figure had increased to 22.8%. The growth has been steady and, on the whole, sound, as indicated by the fact that in 1949, when over-all bituminous production dropped to 435,000,000 tons from 594,000,000 in 1948, stripping operations suffered less than deep mining and actually increased their share from 23.3% of total output in 1948 to 24.2% in 1949.

Stripping is by no means confined to the smaller companies or the fly-by-nights. In fact, among bituminous producers that mined over 1,00,000 tons in 1950, 46 produced their entire output by stripping and 25 operated deep and strip mines together. In contrast, in 1942 only 23 companies mining 1,000,000 tons or more were engaged solely in stripping and only 11 combined deep and strip operations. According to *Keystone*, about 20% of the strip producers in 1950 operated deep mines as well.

Growth and stability of bituminous stripping, especially among deep-mine operators, reflect the urgent need to offset the high cost of underground operations. Stripping enables them to market coal at prices competitive with those of oil and gas, and new and expanded preparation facilities provide a product that matches deep-mined coal in quality. The ability of strip-mined coal to mark up consistent gains is evidence of alert, progressive management and growing care in marketing a quality product.

How the Anthracite Picture Looks

AMONG THE TOP 10 anthracite producers in the last decade there has been a good deal less ferment than in the corresponding bituminous bracket. Table III shows that the top six have remained the same since 1941 with only one change in relative position, when Lehigh Navigation Coal Co. displaced Lehigh Valley Coal Co. in fourth place in 1943. Since 1943, those two companies have held to fourth and fifth places respectively.

Below the leading six companies, in seventh and eight places, there have been a few changes, with the Jeddo-Highland organization moving from eighth to seventh place in 1945, Stevens Coal Co. moving up from thirteenth to eighth place in 1945, and the Harry E. group of companies dropping from seventh down to ninth place. Since 1946, Stevens has held to seventh place and Jeddo-Highland to eighth place except for one year, in 1948, when the Moffat group took over eighth place and pushed Jeddo-Highland down to ninth. In taking over eighth place in 1948 and ninth place in 1949 and 1950, the Moffat group made a fast recovery from 1946, when it ranked twenty-first among anthracite producers. The Harry E. organization meanwhile has been a strong contender, holding consistently to tenth place from 1946 through 1950.

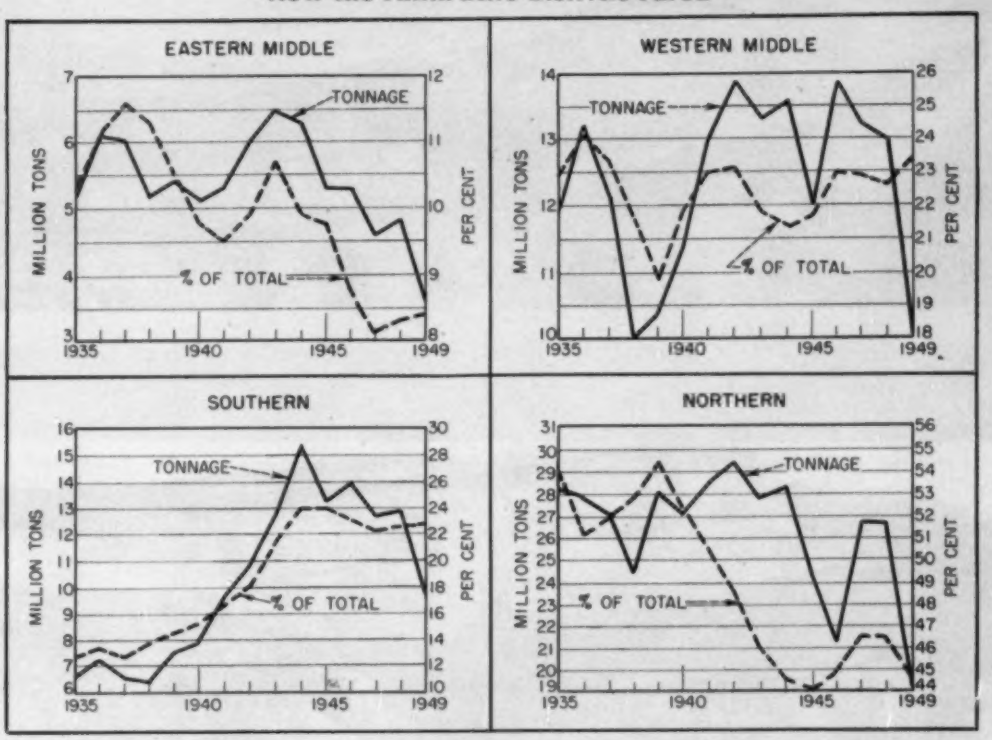
By a margin varying from 500,000 to 3,000,000 tons per year, Glen Alden Coal Co. has maintained its No. 1 spot in anthracite, producing from a low of 12½% of the total output in 1945 to a high of 15.6% in 1942. This company mined 6,475,000 tons in 1949, or 15% of the total, outproducing Philadelphia & Reading Coal & Iron Co., its closest rival, by about 1,450,000 tons; in 1950, 6,779,000 tons, or 15.4% of the total, and 1,700,000 tons more than P. & R.

The top eight anthracite producers in recent years have increased their share of the total anthracite tonnage from 55% in 1941 to 63% in 1950. The tendency to concentrate production in the top eight has been especially strong in the postwar years: in 1945, 55%; in 1946, 56%; in 1947, 1948 and 1949, 61%; and in 1950, 63%.

Southern Field Grows

BY FIELDS, anthracite since 1935 shows a steady gravitation toward the Southern field, mostly at the expense of the Northern field. Since 1935, when the Southern field produced only 12.5% of total anthracite tonnage, it has pushed its share steadily upward until, in 1949, it mined 23% of the total. In the same span of years, 1938-49, the share of the Northern field fell

How the Anthracite Districts Fared



from 54 to 44.5%. Meanwhile, the Western Middle field held fairly steady around 23% and the Eastern Middle field dropped only slightly from 10 to 8.5%.

Anthracite Stripping Makes Big Strides

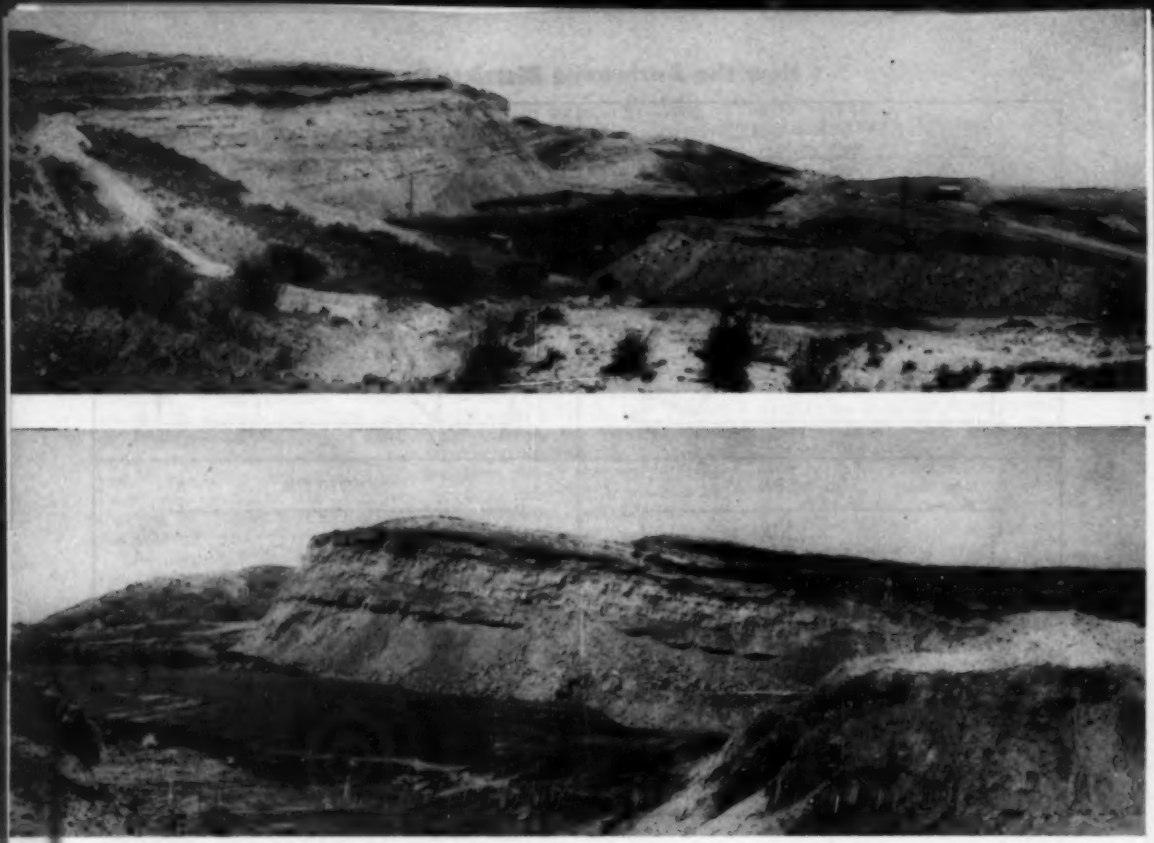
THE STRIPPING STORY in anthracite, like that in bituminous, is one of steady increase at the expense of deep mining.

In 1938, strip operators produced only 5,095,000 tons, about 11% of total output. By 1942 this had increased to 9,071,000 tons and 15%, and eight out of a total of 16 companies affiliated into 10 groups producing 1,000,000 tons or more were engaged in stripping as well as deep mining. By 1944, one company that mined over 1,000,000 tons obtained all its output from strip mines. In that same year, the industry stripped 10,953,000 tons, 17% of the total. By 1950, 13 out of the 17 companies belonging to 11 operating groups producing over 1,000,000 tons mined part of their output from strip pits and two 1,000,000-tons-and-over companies strip-mined their entire tonnage.

As in bituminous, stripping in anthracite reflects the urgency of keeping costs low to meet competition. The growth of anthracite stripping is a manifestation of the imagination and ingenuity of anthracite men who, together with equipment mnufacturers, have built special machines and developed special methods for removing deep overburden, hauling heavy materials on steep grades and mining pitching seams that otherwise could not have been recovered. Like bituminous stripping, anthracite stripping is here to stay.

TABLE III—How the Top 10 Anthracite Producers Ranked, 1941-1950

Company	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950
Glen Alden Coal Co.	1	1	1	1	1	1	1	1	1	1
Philadelphia & Reading Coal & Iron Co.	2	2	2	2	2	2	2	2	2	2
The Hudson Coal Co.	3	3	3	3	3	3	3	3	3	3
Lehigh Navigation Coal Co.	5	5	4	4	4	4	4	4	4	4
Lehigh Valley Coal Co.	4	4	5	5	5	5	5	5	5	5
Susquehanna Collieries	6	6	6	6	6	6	6	6	6	6
Stevens Coal Co.	..	..	..	..	8	7	7	7	7	7
Jeddo-Highland group	8	8	8	8	7	8	8	9	8	8
Moffat Coal group	10	..	..	..	..	..	..	8	9	9
Harry E. group	7	7	7	7	9	10	10	10	10	10
Pennsylvania Coal Co.	..	10	10	9	10	9	9	..	..	..
East Bear Ridge group	9	9	9	10	..	..	..	..	..	..



ELKOL STRIPPING SITE is a point between two draws 1.9 mi north of the preparation plant. Overburden height at the peak was 158 ft; pit length, about 1,250 ft. Top view shows pit looking north; bottom view looking south.

Kemmerer Strips 90-Ft Seam

Job: Working Cover Back to 158 Ft

Equipment: Scrapers, Shovels and Trucks

Product: Double-Screened Oil-Treated Stoker

USHERING IN a new cycle in the utilization of the 90-ft thick Adaville seam near Kemmerer, Wyo., The Kemmerer Coal Co. is now stripping it at its Elkol property and preparing it for industrial use by crushing, double-screening and oil-treating. With a maximum bank height of 158 ft, the initial pit was laid out on the basis of hauling all the overburden to a disposal site across the outcrop, and also for a ratio of 1¼ cu yd of overburden per ton of recoverable coal. Equipment and facilities were set up for a production of 5,000 tons per shift, when desired, in the loading period, which the operation is now in.

Underground mining of the Adaville seam at Elkol was started in the 20s, and recovery was mechanized with scrapers around 1930. With improvements in stripping technique and equipment, coupled with the fact that the seam outcrops only a short distance above the valley floor and approximately at tipple height, the Kemmerer management, including J. L. Kemmerer, Jr., president, and Glenn E. Sorensen, operating vice president, undertook a study of the stripping possibilities. As a result, stripping was begun June 5, 1950, and the first coal was loaded Oct. 19.

The work was contracted to the Morrison-Knudsen Co., Inc., of Boise, Idaho, which also strips at Quealy, Wyo., near Rock Springs, for an affiliated organization—the Gunn-Quealy Coal Co. E. Leo Seifert, superintendent, directs operations for Morrison-Knudsen, with other staff members at Elkol as follows: William Perkins, Jr., project engineer; H. J. Ourada, foreman; Jack Horton, master mechanic; and Ernest Poulson, office manager. The Kemmerer mine staff is headed by Mike Zakotnik, Jr., general superintendent, with Henry Garnick as master mechanic. C. G. Wright is tipple foreman at Elkol.

With 18 to 20% moisture and a

OVERBURDEN AT ELKOL was spoiled outside the outcrop straight in front of the pit or in the draws on either side. The road (left) is approximately at outcrop level.

Btu content of 10,300 to 10,500, the Adaville seam at Elkol is classed as Subbituminous B coal. Aside from two persistent and one intermittent bands, the seam is clean. Consequently, the ash is low—2 to 3%. One of the persistent bands—1 to 2 in thick—occurs 15 ft down from the top, and the other—approximately 1 in—is 12 ft above the bottom. The other—and intermittent—streak is near the middle. As noted, the product is an excellent industrial fuel.

The seam dips 18 deg in a westerly direction and outcrops on the side of a mountain range running approximately north and south. Shallow draws at fairly regular intervals leave projecting points, and for the initial operation a point approximately 1.9 mi north of the Elkol tipple was selected for stripping, with the idea, among other things, that the draws on either side would provide extra spoil room with a minimum haul, and also would permit scrapers to pull straight down the slope to the spoil area in the initial uncovering operation.

STRIPPING

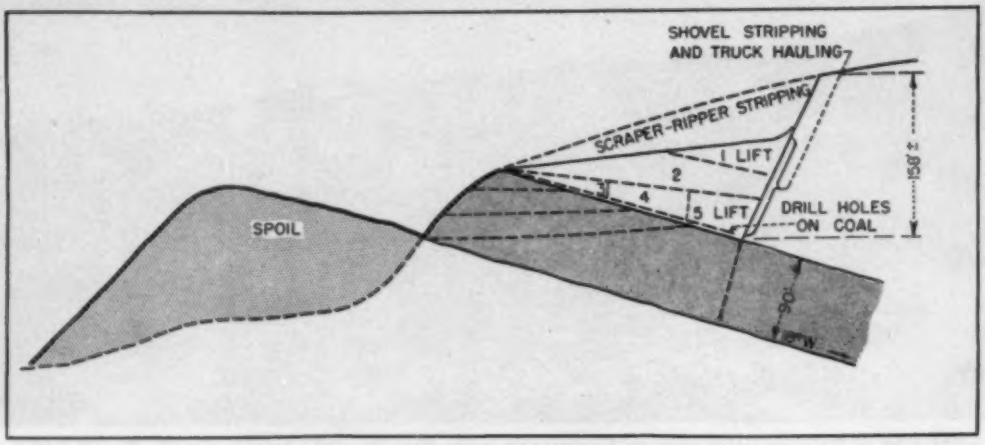
Major equipment used for stripping was as follows:

Phase 1—bulldozer and scraper work: 10 Caterpillar D-8 tractors, seven with Wooldridge TC 170 17-cu yd scrapers and three with Caterpillar angledozers; two Allis-Chalmers HD-19 tractors with Carco bulldozers; and one Wooldridge ripper.

LOADING SHOVEL filling 25 cu yd semi-trailer.

WITH A TOTAL THICKNESS of 90 ft, the coal is removed in benches of 20 to 26 ft after drilling on 18-ft centers 24 ft deep and shooting.

Elkol Coal Loading and Preparation Set Up for 5,000 Tons per Shift



OPERATING PROFILE for the Elkol pit, showing stripping and loading phases. All the overburden was moved by scrapers or hauled away in trucks. Planned overburden to coal ratio was 1¼:1.

FIRST STEP in preparation at Elkol is dumping into 500-ton hopper preceding crusher house and belt.

VARYING TOP SIZE of product of this 42 x 48 crusher for reducing mine-run is done by varying the speed.

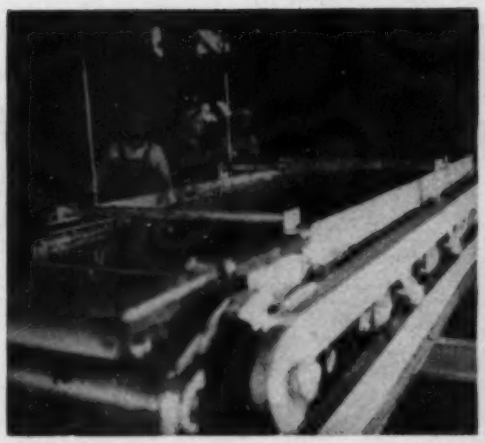
Phase 2—shovel stripping and truck haulage: One Manitowoc 4500 Speedcrane with 5-cu yd dipper; four 17-cu yd Euclid trucks; one 6-in Parmanco horizontal drill; one 6-in portable Winter-Weiss vertical drill with dry-type bits using air for cleaning the holes; and part of the tractor-dozer equipment employed in Phase 1.

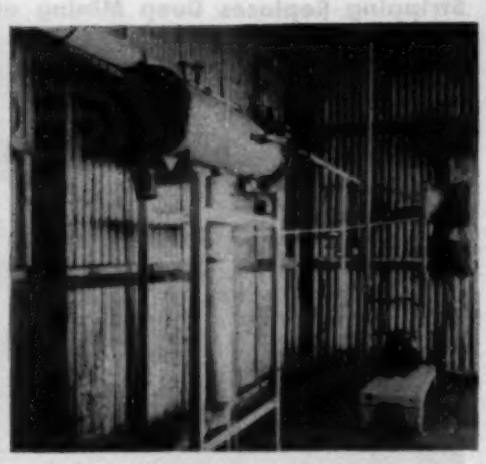
Total length of the pit around the point to the draws on either side is approximately 1,250 ft. The plan adopted was to uncover a coal width of approximately 350 ft, leaving the bank with a slope of 1/2:1, compared to the original maximum of about 1:1. From the coal up, the overburden consists of 10 to 20 ft of shale, 5 ft of sandstone, 25 ft of shale, 10 ft of sandstone and 40 ft of shale, plus other sandstone and shale strata to the peak height.

In Phase 1 of the stripping, the bank was cut down approximately 60 ft, including skimming off surface material and uncovering the face of the coal at the outcrop. In this work the scrapers, with assistance from the angledozers and ripper, pulled straight down the slope as a general rule to the draws on either side or the nose of the point. The average round-trip haul was around 700 ft from loading to disposal points. This phase of the stripping job was completed in September.

Shovel stripping at Elkol was done in three lifts about as shown in the accompanying diagrammatic profile, using the 5-yd Manitowoc Speedcrane. This unit, like all others on the job, was powered by a diesel engine. Electricity was employed only for flood-lighting and at present is used for operating a small Ingersoll-Rand centrifugal pump for dewatering.

Shovel stripping was accompanied by drilling and shooting, using both the horizontal and vertical machines and Atlas No. 1 Flo-dyn explosive in 5-in 25-lb sticks. The final lift was a wedge-shaped section feathering out at the outcrop. It was removed in three sections by drilling down





DOUBLE-SCREENED STOKER is produced on the horizontal vibrator shown at the left. All sizes can be oil-treated, using the heating and circulating unit shown at the right.

CRUSHED COAL coming off the belt conveyor. Drive motor and gearing are inside the pulley.

ELKOL PRODUCT—slack and double-screened stoker for industrial purposes leaving the plant.

along the coal and then shooting and loading. The spoil in this phase of the work was loaded into the Euclids and hauled out across the outcrop to the nearest disposal area. Average round-trip truck haul in this phase of the work was 1,000 ft.

Approximately 500,000 cu yd of overburden was moved before coal loading started, and the pit was set up for moving a total of 1¼ million yards for 1 million tons of coal. As of April 7, 1951, 860,601 cu yd had been removed to uncover about 860,000 tons of coal.

COAL LOADING

Although the Manitowoc shovel has been used for limited periods for coal loading, the regular unit is a Bucyrus-Erie 54-B with 5-cu yd dipper. The coal is hauled to the tipple in 25-cu yd bottom-dump semi-trailers built by Olsen, of Boise, and pulled by Ford F-7 tractors. Distance from the pit to the tipple is 1.9 mi, and the two-lane approximately level road was built with a native-earth subgrade and approximately 2 ft of shale for the running surface. Maximum speed obtained by the haulage units is 45 mph, and access ramps are provided at both ends of the pit to permit straight-through traffic past the shovel and out of the pit.

The coal is loaded in benches of 20 to 26 ft, which is not too high to permit the loading shovel to scale for the protection of the drilling crew. The pit is sloped to the north end to permit all the water to run to a sump, from which it is pumped to an opening driven down in the seam for disposal. General arrangement of the various loading lifts to the time this article was prepared is shown in the accompanying diagrammatic profile.

Holes for shooting are drilled by the Parmanco sidewall unit. Usual centers are 18 ft and usual depth is 24 ft. The holes are loaded with Atlas No. 2 Flo-dyn in 4-in 16⅔-lb sticks. The goal in shooting is ⅓ lb of explosive per cubic yard of coal broken.

Stripping Replaces Deep Mining at Rainbow Plant

RAINBOW STRIPPING at Quealy, Wyo., uses dragline in horseshoe-shaped pit across hogback. The 5-ft seam dips to the right, with the other prong of the horseshoe on the far side of the hogback.

STRIPPING AND LOADING EQUIPMENT at Rainbow includes 14-cu yd walking dragline; small scraper and rotary broom, in addition to loading shovel and 25-cu yd semi-trailers. Stripping ratio is 5:1; ultimately, 8:1.

OPERATING MANAGEMENT includes, at Elkol, Mike Zakotnik, Jr., general superintendent; Henry Garnick, master mechanic; and C. G. Wright, tipple foreman; at Rainbow, Charles C. Chesnovar, master mechanic.

RAINBOW PREPARATION PLANT produces usual domestic sizes and a variety of slacks and double-screened stoker for industrial, commercial and household use.

PREPARATION

Haulage units at Elkol dump into a 500-ton hopper to start the preparation cycle, which uses a part of the original Elkol tipple with the addition of crushing, conveying and special chute-loading equipment. From the hopper the coal is fed to a Jeffrey 42x48 Flextooth crusher by a 50-in-wide apron feeder operating at 40 fpm and driven by a 30-hp explosion-proof motor through a U. S. variable-speed drive. The feeder and the belt conveyor taking the coal into the tipple were provided by the Idaho Sprocket & Machine Co.

Sizes produced at Elkol are 1⅝x0 slack, 1x0 and 1x⅜s double-screened stoker. All may be oil-treated with 70-gravity oil, using Viking equipment.

Top size of the Elkol product is attained, within a tolerance of plus or minus 10%, by varying the speed of the crusher, which is driven by 150-hp slip-ring motor, using the speed controls from the hoist employed in the original deep mining. The idea was worked out by Messrs. Garnick and Zakotnik. To make minus 1-in coal, the motor is operated at its rated full speed of 350 rpm. To make minus 1⅝-in coal, the speed is reduced to approximately 175 rpm.

The crusher also is equipped with a control which stops the feeder when the crusher-motor speed drops to 130 rpm as a result of crowding or plugging of the crusher. This control is described in the Operating Idea on p 104 of September *Coal Age*. Extra protection against pile-ups as a result of plugging is provided by a limit switch in the hopper to keep big lumps out of the feeder, and by close setting of the thermal-overload relays in feeder controls to stop it before excessive overloads are encountered. With this control set-up practically no trouble has been encountered in crusher operation, even at flow rates of up to 730 tph, the maximum encountered to date. Rated capacity of the installation is 500 tph.

From the crusher the coal is fed onto a 42-in belt, 175-ft centers, 400 fpm, for elevation into the tipple. This unit also was provided by Idaho Sprocket & Machine Co. and includes an internal-drive head pulley. In other words, the motor and gearing for the conveyor drive are inside the head pulley, materially simplifying the installation and reducing space requirements and steel work.

From the conveyor the coal flows directly to the car-loading chute if straight untreated slack is being produced. If double-screened stoker is being loaded, the coal is diverted to a Symonds horizontal screen, with plus-1 and minus-⅜s routed back to a straight-slack car. Oiling is done at the 1x⅜s loading point, to which straight slack also can be brought if it is to be treated.

RAINBOW STRIPPING

Stripping also has taken over from deep mining at Rainbow mine, at Quealy, Wyo., operated by Kemmerer under the name of the Gunn-Quealy Coal Co. The seam being recovered is the No. 7, about 5 ft thick and pitching approximately 8% northwest. Overburden consists of rotten standstone immediately over the coal, followed by alternate layers of hard and soft sand and shale. Present stripping ratio is about 6:1, and the maximum contemplated is 8:1.

The stripping site is a saddle or hogback on top of the mountain approximately 1,000 ft above the tipple. To start operations a box cut was made around the outcrop, starting on one side of the hogback, working up and around the nose of the outcrop and down the other side. In other words, the pit is horseshoe-shaped. From the outcrop, stripping will be continued down the pitch until the maximum bank height of approximately 40 ft is reached.

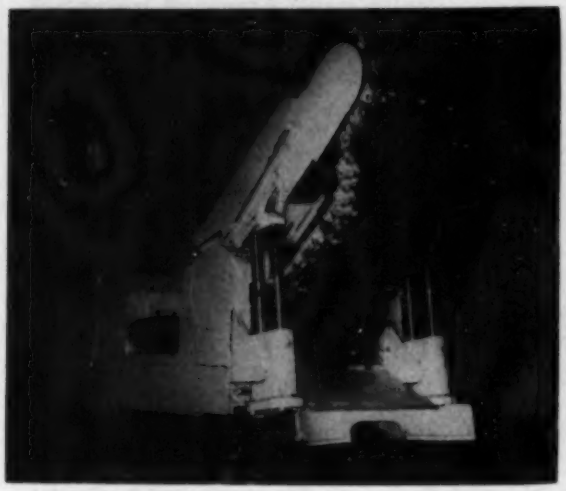
The stripping unit is a Bucyrus-Monoghan 10-W walking dragline with 14-cu yd bucket. Cuts range from 100 to 150 ft in width, with some special exceptions, and standard casting procedure is followed. Overburden drilling is handled by a Winter-Weiss unit.

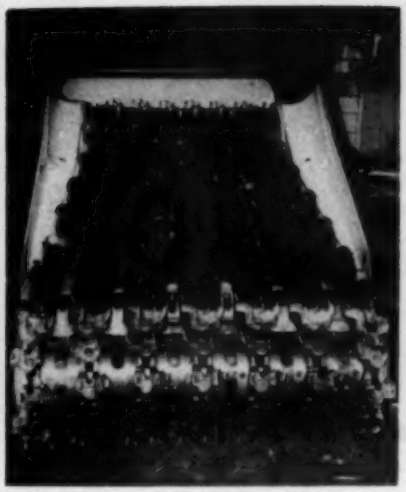
Loading is done by a Northwest No. 6 shovel, powered by an internal-combustion engine, with a 1½-cu yd dipper. Drilling is done with air equipment. Cleaning prior to loading is done by a Caterpillar tractor with 5-cu yd scraper, supplemented by a Hough broom on an Allis-Chalmers wheeled tractor. The broom unit also acts as a dozer for the loading shovel.

Production ranges from 700 to 1,000 tons per shift and is hauled to the tipple, a distance of 2½ mi, by tractor-trailer units similar to those at Elkol. The road was built of native material topped off with 1 to 2 ft of boney.

Except for a thin band near the top, the coal is clean. Sizes normally prepared are lump, grate, pea, nut, and the following slack and double-screened stoker sizes: 1⅝x0, 1¼x0, 1⅝x⅜s, 1¼x⅜s, and ⅜sx0. Hot-oil treating with SAE 50 oil can be done as desired. Oil lines are ¾-in copper inside 2-in steam lines, thus assuring proper conditioning of the oil without separate heating lines and recirculating pumps.

The Gunn-Quealy staff is headed by William T. Steinhour, superintendent, with Frank Zubal as foreman, Charles C. Chesnovar as master mechanic and Frank Tominc as tipple foreman, Cecil Amick is superintendent for Morrison-Knudsen.





FOR BETTER PRODUCTION, coarser coal and ability to cut clearance for the unit, the new mining head features ball-joint chains spreading from back to front and featuring special bits and bit arrangement to eliminate coring or channelling.

Mechanizing Pitching Longwall

MOBILE MACHINE developed by Dominion Coal for longwall mining on pitches up to 17½ deg has major application possibilities in anthracite and bituminous mining throughout the world

WITH CHAIN-TYPE HEAD cutting 57 in wide on a 500-ft-long wall, maximum advance to date is 350 ft in 6½ hr with a 6-man crew

By FRANK DOXEY

Assistant General Manager, Dominion Coal Co., Ltd., Sydney, N. S.

ENCOURAGING RESULTS to date lead to the conclusion that the Dosco miner has major possibilities as a coal-production tool throughout the world. The machine has been subjected to arduous trials to reveal any possible weaknesses, and the Mark II, or redesigned, version, which went into operation April 16, 1951, is delivering coal of a suitable size at a satisfactory rate, with little or no machine trouble or maintenance.

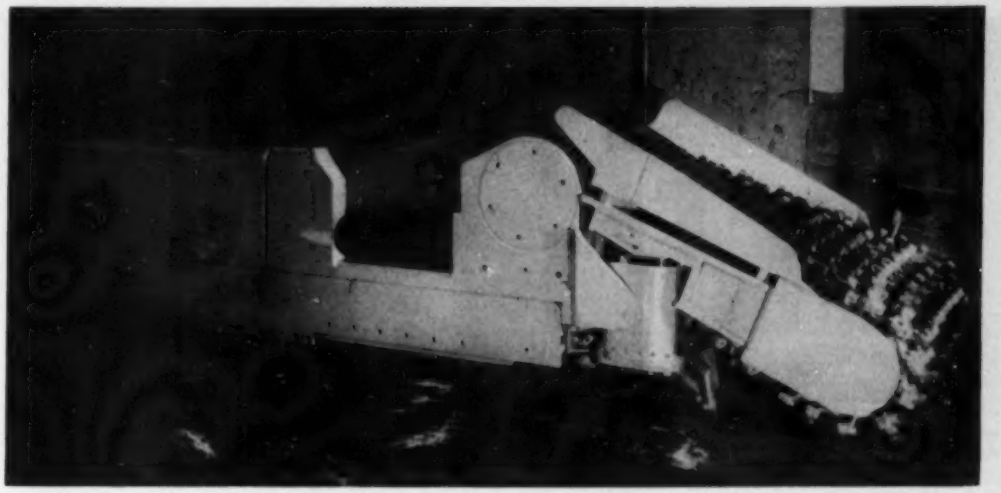
The best run to the time this manuscript was prepared was 350 ft in 6½ hr of cutting. The production was 400 tons, with a machine crew of six. This was achieved on a 500-ft wall straight up and down the full pitch of the Harbour seam at No. 18 colliery of the Dominion Coal Co., Ltd., New Waterford, N. S., where the dip is 17½ deg, or 31%. Coal thickness is 6 ft.

GOALS IN DESIGN

Development of the miner was undertaken by the Dosco organization because it was felt that conditions in Nova Scotia could best be met by a machine that would be adaptable to longwall mining, which experience has proved provides the best results under Nova Scotia conditions, which include pitches exceeding 17 deg and cover up to 2,000 ft in thickness at present, with perhaps 4,000 ft ultimately.

The program was initiated and carried forward under the inspiration and close direction of H. C. M. Gordon, general manager of Dosco coal operations. Design was handled by J. A. Russell, chief mechanical engineer, and his staff, and general assistance in other phases of development and application was enthusiastically rendered by members of the general staff and officials and men at the colliery. The machine is being built by Trenton Industries, Ltd., Trenton, N. S., a subsidiary of Dominion Steel & Coal Corp., Ltd., under license from the Joy Mfg. Co., around whose patented multichain shearing jib the unit has been developed. Joy is the sole distributor of the machine to all operators other than the associated companies of Dominion Steel & Coal Corp., Ltd.

Specifically, to meet the conditions encountered in Nova Scotia mines, it was felt that any machine



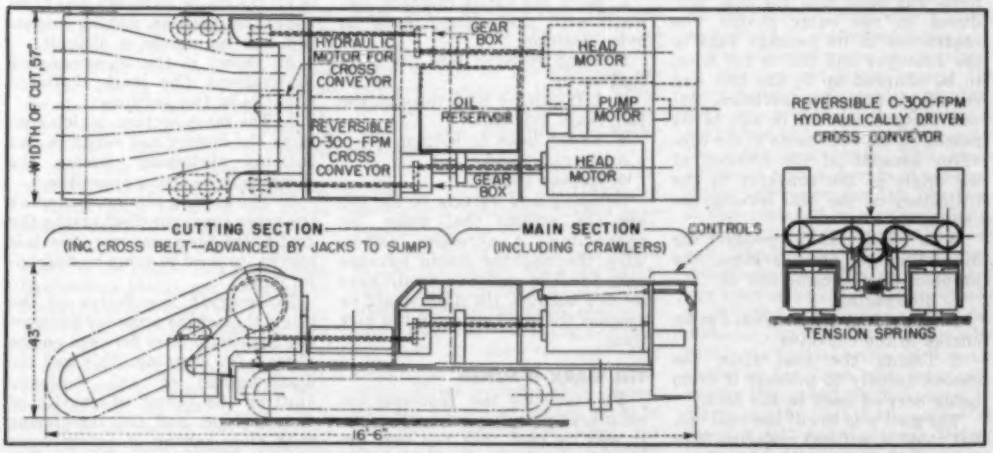
MINER WITH HEAD IN DOWN POSITION ready for the sumping stroke. Entire front section, including cross conveyor, is moved forward by jacks. The coal is carried back to the variable-speed cross conveyor, which discharges to face conveyor alongside machine.

With the New Dosco Miner

developed should have the following characteristics:

1. Ability to cut and deliver coal in quantity and of the proper size.
2. Easy maneuverability.
3. Suitability for longwall mining.
4. Ability to mine without interfering with timbers already set.
5. Ability to cut its own stable.
6. Ability to work on reasonably heavy grades.

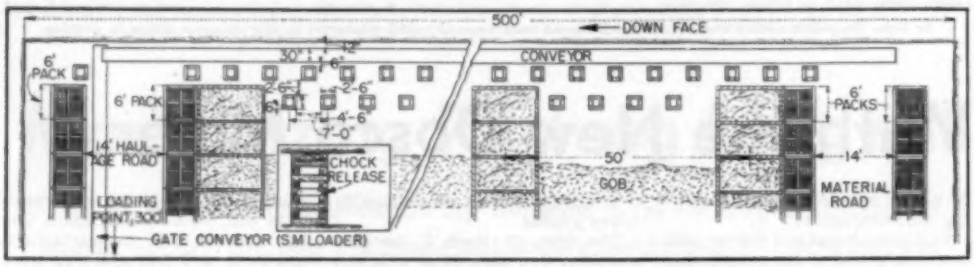
The first, or Mark I, machine was 18 ft 4 in long, 54 in wide and 40 in high. It worked reasonably well, but would not produce coal of the proper size, was not easily maneuverable on heavy grades, and interfered with timbers already set. Six cutter chains with nine-point lacing provided a total cut of 54 in with bit lines 1 in apart. The 1-in spacing was unsatisfactory, and 1-, 2- and 3-in spacings were tried at different points across the head. These worked fairly well in soft coal and with the chains nearest the "free" side of the coal. However, channeling or coring occurred on the solid side, while the



TWO MAIN SECTIONS feature miner design and provide greater stability in operation. The rear section, mounted on crawlers, contains motors, pumps and controls. Front section, moved up by jacks to sump, includes the cutting head, side lifting jacks and transfer belt.

Efficient Longwall Mining on Pitches the Goal in Miner Design

ACCESSIBILITY WAS MAJOR GOAL IN REDESIGN, with practically everything reachable from the top or sides. Left is motor driving hydraulic pumps, with valves and oil tank forward. Center shows head motors in place on either side of pump motor, with controls at rear and one of the splined shafts used to drive the chains upper right. Hydraulic jacks for sumping (right) are placed under the machine.



DOSCO LONGWALL PLAN for continuous mining, showing packwalls, chocks and position of face and gate conveyors and other auxiliaries. The wall is planned for cutting in both directions and for the machine to cut its own stable.

bit blocks rubbed the coal and increased the fines, at the same time overloading the motors.

In addition, the design of the head was such that the coal produced by the outer chains was obstructed in its passage back to the conveyor and fell to the floor, to be churned up by the bits and reduced to fines. Furthermore, coal was further reduced in size in its passage from the chains to the conveyor because of the relation of the angle of the conveyor to the trajectory of the coal leaving the chains.

With quality of the product the biggest single consideration, the problem then became one of:

1. Bit spacing.
2. Delivering all the coal cut by chains to the conveyor.
3. Taking the coal from the chains quickly to prevent it from being carried back to the face.

The goal was to cut the coal out, but to do it without reducing it to extreme fines, and also to do it without channeling or coring between either the bit lines or the chains which would interfere with the mining cycle, which is as follows:

1. Move the entire machine forward with the cutting head in down position.
2. Sump forward into the solid coal 18 in.
3. Lift cutting head through the full seam thickness.
4. Lower head to bottom.
5. Retract head.
6. Repeat cycle.

Sumping and cutting to the top are the actions that make "no channeling" a necessity. Otherwise, the machine would advance only 4 to 5 in and then would have to stop because the nose would be against the solid between the pick lines.

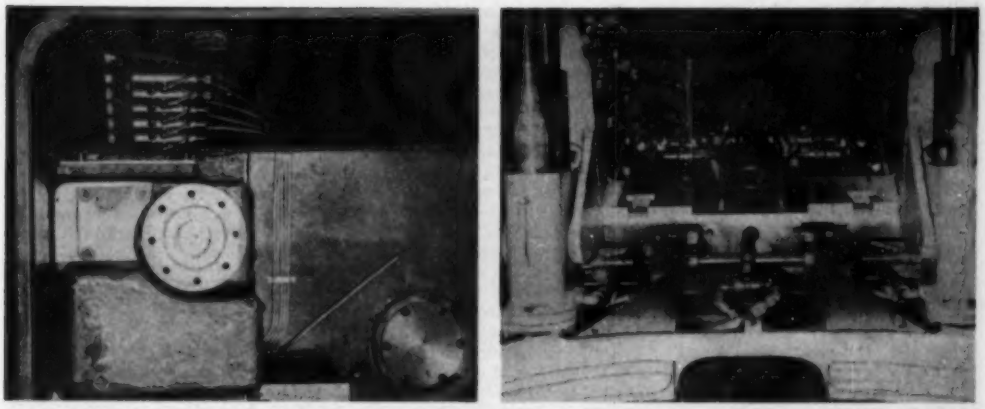
THE MARK II MINER

To overcome the problems encountered with the original miner, it was decided that the best approach was to develop a new machine which would produce a coarser coal, would be easier to maneuver on heavy grades, and would be easy to inspect and maintain. With the original unit, access to all the major elements was from under the machine, making inspection and maintenance difficult.

As shown in the accompanying illustrations, the Mark II Dosco miner is in two sections:

1. The main section, which contains the motors and controls and remains stationary during the sumping and cutting operation.
2. The cutting section, including the cross conveyor discharging the coal to the face conveyor, which is moved forward to sump by hydraulic jacks.

In contrast, the design of the original machine provided for moving the entire body forward on the chassis for sumping. This had the disadvantage of (a) radically shifting the center of gravity of the machine, and (b) interfering with close setting of safety posts at the rear to protect the operator in bad top.



MACHINE DETAILS include (left) section at front showing gearbox on one end of shaft driving cutting chains, and also slide-lubricating mechanism and conveyor-drive pulley housing. Right is a view under the cutting head with plough cover removed, showing hydraulic motor for operating cross belt conveyor and hydraulic hoses to the head-lifting jacks, two on each side pivoted to the main frame.

Now, the entire unit is mounted on a pair of crawler treads 14 in wide against 10 in in the original model, and, as noted, only the head section moves in sumping. Each crawler, one on each side of the unit, is provided with a 3-cylinder hydraulic motor, and each can be operated independently. The change provided the machine with additional power and improved handling on heavy grades. The miner can turn completely around in its own length.

Redesign of the mining head was perhaps the most important operation. One goal was spreading the chains from back to front, or from 38½ to 58 in, to provide cutting clearance for the main body of the machine while still keeping gear boxes and other facilities within the over-all width limitations. This necessitated the use of a ball-joint chain. Also, because of the spread of the chains and to keep them running in the same relative position (overtaking of the blocks is prohibited because the bits overlap at the back of the head) chains with different pitches are required.

Each chain is made up of 40 blocks, each block designed to carry two bits, with the exceptions noted in the succeeding paragraph. Succeeding blocks are designed to stagger the bits right and left, thus providing four bit lines on 2-in centers.

A number of experiments were carried out to determine the best type of bit. So far, it has been found in the Austin Hoy Carboloy-tipped bit with 20-deg forward rake. Every tenth block is fitted with a single bit projecting alternately right or left at an angle of 20 deg to break out the core or channel between the chains. Except in the outside chains, the second bit is omitted in these blocks to permit overlapping from chain to chain at the back of the head. By the time the core-breaking bits come along, the regular bits have cut to the depth where the core must be broken to prevent the head striking solid. Breaking the core or channel in this fashion also increases the percentage of coarse material in the product. A total of 536 bits is used on the head.

The chains are driven by individual sprockets on a single master shaft at the rear of the head, in turn driven by jack shafts and gear boxes at each end. The connections between the gear boxes and the two driving motors in the main section of the machine are telescopic splined shafts. These driving motors are 75-hp water-cooled units designed for heavy overloads.

In the latest design of head, facilities for adjusting the tension of each chain individually have been provided in the nose.

Plough-share guides are fitted to the top of the head on either side to guide all the coal cut by the chains back to the cross conveyor. Clean-up ploughs also are provided in front of each crawler and across the main body of the machine. Those in front of the crawlers are hinged to permit them to ride over obstructions when the machine moves backward. A curved rubber lip on the bottom of the main plough performs the same function for this unit. Normally, these ploughs keep the floor reasonably clean. Auxiliary jacks are provided at the rear of the main section on the new machine to tilt it forward to cut further down if necessary for any reason, such as loose coal or projections raising the machine, or a change in the grade of the floor.

In the original Dosco miner, the lifting mechanism was built inside the head, where it was difficult to get at. In the Mark II machine, lifting is done by telescopic jacks on the outside of the head, as indicated in the illustrations. Tubes sliding back and forth in trombone fashion through the oil reservoirs supply the hydraulic equipment on the head. This eliminated hydraulic hose connections, which failed as a result of continued flexing.

The cross conveyor in the original machine projected beyond the main body. Consequently, any timbers set alongside the face conveyor had to be removed to permit the machine to pass. This cross conveyor was a double chain-and-flight unit operating at 120 fpm. It was replaced by a hydraulically operated 0-300-fpm variable-speed belt. The belt is reversible to permit discharge either way, depending upon machine direction. Speed is adjusted in accordance with the distance from the face conveyor by turning a control valve. If the machine is far from the face conveyor, the speed is increased to discharge the coal to the center of the face unit, and vice versa. Drive, idler and tensioning pulleys are arranged so that the tension may be released hydraulically and the

belt changed in less than 10 min.

Crawler motors, head-lifting jacks, cross belt, sumping jacks and rear-lifting jacks are served by hydraulic pumps powered by a 30-hp motor. Working hydraulic pressure is 1,500 psi. Electric power is brought to the machine by two main cables—one for the 30-hp pump motor and the other for the 75-ph head motors. Starting and control equipment is separate from the machine, which is provided with remote-control relays only. This simplified construction and reduced the weight. All controls—both electric and hydraulic—are mounted on a panel at the rear of the machine, thus removing the operator as far as possible from the face and to a point where he is under supported top.

The machine is 16½ ft long, 58 in wide and 43 in high. Weight is 19 tons. In the new design all major parts are accessible from the top or side for inspection and maintenance.

Work is still going forward on finding the most effective method of suppressing dust. Initially, sprays operating with a pressure of 200 psi were used in the nose of the machine. This was changed to sprays on the top, on the gob side and under the head, and modifications of this arrangement are being tested. In general, moving the sprays back and providing for greater spread has given good results with reduced water consumption. Water is brought to the machine through a short length of hose, which is moved from connection to connection—40 ft apart—on a pipeline suspended from the timbers along the face.

HOW MINING IS DONE

The Mark II miner, as previously noted, is working on a 500-ft wall in the 6-ft Harbour seam at No. 18 colliery, and other units are to be installed in other Dosco collieries.

On the present No. 18 wall, mining is being done down the pitch only because of its steepness, which, as noted, is 17½ deg, or 31%. With calks of the proper type the machine could hold itself up the pitch, but would tear up a soft bottom. Roof jacks also could be provided—and are being considered—but setting and releasing them would require an interruption in the normal cycle, with consequent loss of time. In addition, it is more awkward for the operator, as well as the machine, to work up a pitch of this magnitude.

For these reasons the machine is trammed back to the top each cut. The time for the 500-ft distance is approximately 1 hr 20 min, or probably no more and perhaps less than the time required to set and release roof jacks—if they were employed—in cutting up the pitch. In addition, working down the pitch is easier and more comfortable, with consequent improvement in production. On the steep No. 18 wall, a stable, or new starting point, for the miner is made by undercutting and shooting. On lesser pitches, stables are cut by the machine itself as described below.

A diagrammatic plan of a normal 500-ft wall for the Dosco miner is shown in an accompanying illustration. Length is 500 ft up and down the full pitch, or reasonably near thereto. To start a new cut, the face conveyor is moved up against the coal and the miner starts cutting from a stable at either end. Support behind and along the face is provided by 12-ft-thick packwalls on 50-ft centers, by cribs or chocks 24 in square on 7-ft centers, and by props and crossbars also on 7-ft centers behind the machine and elsewhere as needed. As the face advances, the rear of the two rows of chocks is moved up and the packwalls are extended.

To cut a stable in preparation for a new pass along the face, the miner moves back from the end of the cut some 35 or 40 ft, and then makes a series of gripping cuts either right or left, depending upon direction, to a maximum depth of about 7 ft. This provides sufficient space for it to straighten up and cut to the end of the wall. It then backs into the roadway, turns around, moves into the stable and starts the new run. To transfer the coal made in cutting stables, the plan is to use a short lightweight portable conveyor when the miner is over 3 to 4 ft from the face conveyor. Up to that distance the cross conveyor on the miner can be speeded up enough to bridge the gap.

MINER PERFORMANCE

The best run made by the miner at No. 18 colliery to the time this manuscript was prepared was, as previously indicated, 350 ft in 6½ hr of cutting. The machine crew consists of two operators, three timbermen and one mechanic. Two operators are considered desirable because a high degree of concentration is necessary to maintain speed, thus making alternation desirable. Also, with two qualified men, the presence of at least one each shift is assured.

The timbermen handle support behind the machine and move up the chocks, being assisted in this work by Meco chock releases. Coal from the face conveyor along the wall is discharged to a car-loading conveyor in the lower roadway.

Times and measured continuous runs of the miner at No. 18 were:

10 ft	6 min
12 ft	8 min
20 ft	12 min
30 ft	15 min
58 ft	45 min

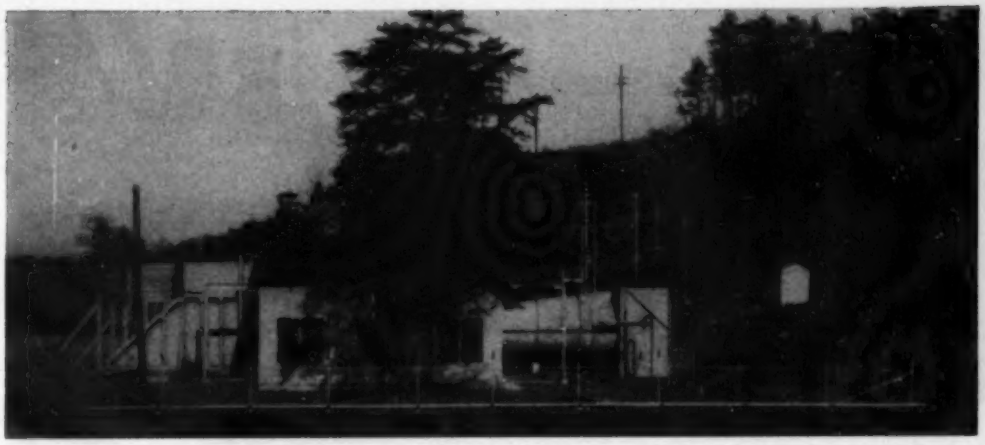
Actual times for the various phases of the production cycle are:

Move to the face (Sec)	3-10
Sump 18 in	5-9
Cut to top	9-14
Drop head	14
Total (Sec)	33-57

It will be seen that the actual coal-production motions total 14 to 23 sec. Therefore, when the machine hits its peak, it produces as much as 2 tons in 14 sec, or at a rate of approximately 8 tpm. This production completely buried the shaker conveyor originally installed on the face and caused numerous stops of both the conveyor and the machine itself.

It was decided that a belt conveyor was necessary in view of this condition, and an existing troughed unit was converted into a flat unit pending the design and acquisition of a special belt for the service. One requirement is ready advancement to the face, including any necessary breaking up into sections for the purpose. The modified unit is 30 in wide and operates at 270 fpm. Its installation has significantly improved the continuity of operation and, in turn, the output of the unit. One result of continuous operation is that advantage can be taken of the liberation of pressure stresses in mining, with greater ease of operation and a tendency toward production of larger pieces. If there are delays, the coal stops working, and the job of the machine is increased proportionately, with adverse effect on size consist.

With the opportunity to work continuously, which improvement in transportation will provide, the Dosco miner should be able to settle down and provide consistent results. The test period with the first of the new type indicates that they will be quite satisfactory in terms of tons per man, ease of operation and safety.



FULLY PROTECTED by standby gasoline engine drive and automatic signal system, this T.C.I. fan—one of seven remotely located units in the automatic system—exhausts 304,000 cfm from a shaft 548 ft deep without the need for attendants.

How T.C.I. Achieves Ventilation Supervision With . . .

Automatic Fan Signals

Continuous Fan Operation Assured by Gasoline Standby Drives Connected Automatically

Dependable Automatic Signal System Provides Automatic Check on Operating Conditions

By H. B. BUCKINGHAM

Electrical Engineer, Coal Mines, Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.

ADEQUATE SURVEILLANCE of a ventilating system serving over 67 mi of active and worked-out gaseous coal-mine workings requires a dependable automatic signal system. Its importance can be better understood when it is noted that in a typical month, chosen at random, the mines served by this system gave off an average of 7,800,000 cu ft of methane every 24 hr. This large volume of gas is typical of operating conditions in the five mines of the Tennessee Coal, Iron and R. R. Co., near Birmingham, Ala., producing about 5,000,000 tons of coal annually.

To achieve that ventilation supervision which modern mine safety demands, automatic signals from the fan stations are transmitted directly to the lamphouse at each of the five mines. Lamphouse attendants on duty three shifts each day are kept informed of the operation of remote fans and associated equipment by the automatic signal system.

The automatic signal system replaces full-time attendants who formerly were on duty three shifts per day seven days per week at each of the seven fans. Three fans are near the main portal and needed no attendant.

The 10 main fan stations serving these mines are located at varying distances from the main portals, the most remote being 8 mi away. Fully automatic fan operation is assured by a normal-drive 2,300-v 3-phase 60-cycle motor direct-connected to a common jackshaft with an auxiliary gasoline engine. The gasoline engine is connected to the common drive shaft by a magnetic clutch energized by a 125-v DC generator belt driven from the engine.

Power for starting and controlling the engine is supplied by two 12-v storage batteries. Control power is obtained from either battery by a selector switch. During the cranking period both batteries are automatically connected in parallel to assure ample starting power. The engine normally starts, accelerates and drives the fan in 3 to 5 sec after a primary line-power failure.

The fans, of the exhausting type, are belt-driven from the jackshaft. The motor, jackshaft and engine are mounted on a common sliding base for fan-belt adjustments. Fan-motor horsepower ranges from 125 to 600. The gasoline standby engines range from 150 to 450 hp at 1,200 rpm.

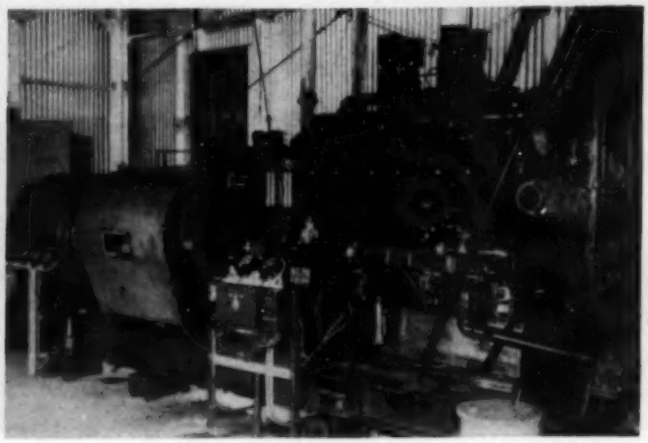
How Signals Are Transmitted

Power for the signal system is 125 v DC, supplied by a rectifier when the electric motor is driving the fan. In event of an AC failure, power for signals is supplied by a 0.5-kw generator belted to the auxiliary engine.

Signals are transmitted from the remote fan station to the mine lamphouse over a special aerial-type self-supporting 11-pair No. 22

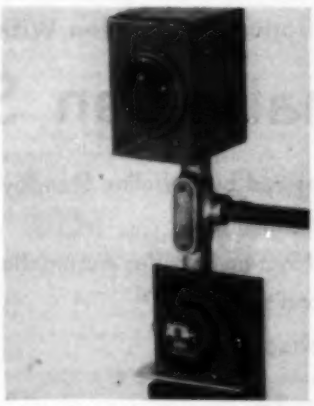
Fan Protection Supplements Supervision by Automatic Signal System

MAGNETIC LATCHES hold exhaust-duct doors open on this 314,000-cfm fan.

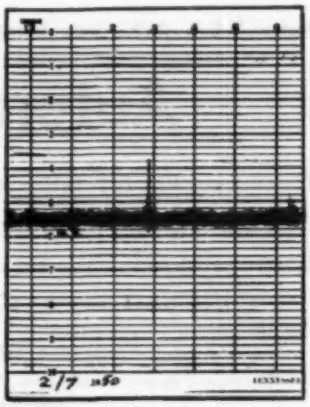


FAN-DRIVE INSTALLATION, showing arrangement of motor and auxiliaries, including gasoline engine, controls and bearing relays.

JUNCTION POLE in automatic system showing self-supporting signal cables and watertight pole-top junction box.



CHIME AND RED LIGHT inform lamphouse man of any change to or from normal operation of remote fan station.



HOW STANDBY TAKES OVER—on test Feb. 7, 1950, engine accelerated fan by time pressure had dropped from 5.5 to 3.8 in.

wire cable. Each conductor has rubber-latex insulation. The cable has a wrapping of copper shielding tape and an outside jacket of tough plastic with a built-in self-supporting messenger wire.

Other cable also in use for fan signals is of the same construction except that it is 14-pair No. 18 wire. All aerial cable is in 2,000-ft lengths and is joined in watertight pole-top junction boxes. The junction boxes also serve as openings to test the cable for faults.

Where two fans are in the same general direction from the mine portal, the 11-pair cables from each fan are terminated at a common junction point. From this common junction to the mine the 14-pair cable is used to advantage over two 11-pair cables. With 11-pair cable, each pair of wires is connected in parallel, providing five circuits with one spare pair. With the 14-pair cable, individual conductors are used for 12 circuits, leaving one spare pair.

The aerial signal cable is exposed throughout its entire length. Should the cable be damaged in any manner, erratic or obviously false signals will be received by the attendant and the cause will be immediately investigated.

A mine-type telephone is installed in each fanhouse and is connected to the two spare wires in the aerial signal cable. The telephone wires are terminated at small switches in the lamphouse. By proper switching of the telephone, the sounds of operation in the fanhouses are audible to the lamphouse attendant, since the receiver is left down in the fan stations. The telephone wiring has been reconnected for common-battery operation to prevent unnecessary discharge of batteries by leaving the receiver down in the fanhouse. The telephone thus serves as a check at any time on the signals. By listening in, the equipment operating is easily determined.

How Signals Are Received

The signal cable from the fan station terminates in a steel cabinet housing the control relays at

the lamphouse. In the hinged front doors of the cabinets are flush-mounted indicating lights and two pushbuttons for testing and cutting off the alarm. The alarm siren which sounds if the fan should stop is connected to this box.

Two 30-w 24-v lights, each with a green lens, indicate that the fan is running. These lights are connected in parallel. If one burns out, the other will indicate the fan is running.

One 30-w 24-v light with red lens indicates that the fan is stopped. The siren sounds whenever the fan stops.

The green running lights are intermittently off-on every 2 sec, with control by a 24-v motor-driven blinker.

Mounted in the lamphouse, but remote from the signal cabinet, are heavy-duty 24-v chimes with the 30-w red light in parallel with the operating coil. If the 2,300-v underground feeder breaker opens or closes, or if either the fan electric motor or gasoline engine starts or stops, the chimes sound and the red light burns. These signals notify the attendant of any change in operations from or to normal. The exact change is registered by the indicating lights on the panel.

The preceding 24-v DC equipment is powered by the lead-acid storage battery adjacent to the signal cabinet.

The remaining lights on the signal panel are powered by 125-v DC current from the fanhouse. These lights and relays are low wattage to prevent excessive IR drop in the signal cable. A white light indicates the position of the 2,300-v underground feeder breaker. One green light shows that the fan electric motor is running. An amber light shows whether the gasoline engine is running, and a white light indicates the position of the M-G set DC breaker feeding power underground. All lights and devices are clearly marked by engraved nameplates.

How Signals Operate

The propeller-type fans have been equipped with hinged doors held open by magnetic latches. A 125-v time-delay relay controls the 12-v magnetic latch and is connected so that if the standby engine fails to start, or is not up to speed in 10 sec after a power or motor failure, the latches release, permitting the doors to close. This prevents both fan and air reversal. The doors close by a counterweight and gravity and are manually reset in the open position after the fan is restarted.

Two airflow switches installed in the fan duct control midget relays in the signal cabinet. These relays, in turn, energize the green "fan-running" lights, the red "fan-stopped" light, and the siren. All other indicating lights are controlled by auxiliary contacts on the respective circuit breakers.

In normal operation the electric motor drives the fan, the engine is on standby basis, and both the 2,300-v and DC-feeder breakers are closed. For this normal condition, the following lights on the signal cabinet are energized:

A. Two large green lights: "Fan running."

B. Small green light: "Electric motor running."

C. Small white light: "Underground feeder breaker closed."

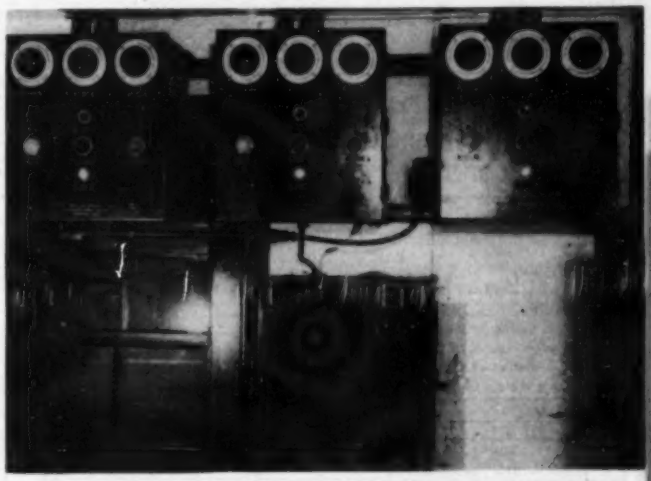
D. Small white light: "DC breaker closed."

In event of a power failure the auxiliary engine will start and drive the fan. Both power-feeder breakers will open, removing power from underground. In the lamphouse the chimes will signify a change in operations and the lights will indicate as follows:

A. Two large green lights: "Fan running."

B. Amber light: "Engine running."

FULLY AUTOMATIC control panels for fan motor, gasoline engine and 500-kw m-g set.



TYPICAL ARRANGEMENT of fan-signal panel and telephone in lamphouse. Each panel includes lights and relays serving one fan.

Detailed Reports Emphasize Effective Maintenance of T.C.I. Fan System

C-506-7-49 Sheet 1 of 2

TENNESSEE COAL, IRON AND RAILROAD COMPANY
COAL MINING DEPARTMENT
DAILY INSPECTION REPORT – AUTOMATIC FAN STATIONS

1. MAIN BEARINGS

Bearing	Temp. Rdg.	Oil Level	Added Lub.	Feel and Sound
#1 Bearing				
#2 Bearing				
#14 Bearing				
#15 Bearing				
#16 Bearing				

2. FAN DRIVE BELTS
Condition of Belts:
Alignment Tension
Dressing Applied

3. MOTOR
Watt Hour Meter Reading Ammeter or Watt Meter rdg.
Temperature Feel and Sound

4. BATTERIES

Battery	Connections	Water Level	Specific Gravity	Left on Charge
No. 1				
No. 2				

5. GAS ENGINE (While Idle)
Gallons Gas Reserve Oil General Condition
Oil Level Water General Condition
Water Level Generator Belts Tension
Water, Gas, Oil Leaks
Carburetor Linkages and Bearings

Sheet 2 of 2

6. GENERAL
Water Gauge Inches Recording Gauge Inches
Recording Chart O.K.? Changed Chart?
U. G. Feeder Watt Hour Meter Reading

7. GAS ENGINE (Running)
Engine started properly? All cylinders firing properly?
Pounds Oil Pressure Generator Charging Amperes
Condition of Exhaust
Engine Idled properly? Subnormal performance, if any?

8. EQUIPMENT LUBRICATED AS PER G.I. E & M Nos. 21 and 24?

9. REMARKS:

Mine
Station Time (From) (To)
Inspected By Date
Approved
Maintenance Foreman

C-507

TENNESSEE COAL, IRON AND RAILROAD COMPANY
COAL MINING DEPARTMENT

WEEKLY INSPECTION REPORT – AUTOMATIC FAN STATIONS

1. Bearings flushed (List Numbers)
2. Water in gas tank?
3. Water in crank case?
4. Operation of signals as reported by Lamphouse Attendant.

Condition	Signal				
	Blinker	Red	Siren	Green	Amber
a. "Signal Rectifier" Switch-Off					
b. "Signal Rectifier" Switch-On					
c. Motor Stopped					
d. Motor Running					

5. Motor Stopped O. K. ? Engine Started O. K. ?
Clutch engaged O. K. ?

6. Pounds Oil Pressure Recording Water Gauge Reading:
All cylinders firing O. K. ? Motor Running?
Maximum Water Temperature? Engine Running?
Generator, Charging Amperes Clutch Air Gap O. K. ?
Condition of Exhaust Loose bolts, excessive vibration or noise?

7. Motor started O. K. ? Engine Idled O. K. ?
Temperature of Clutch after Running O. K. ?
Gas sediment bowls clean?

8. Equipment lubricated as per G. I. E & M Nos. 21 and 24?

9. Remarks:

Mine
Station: Time (From) (To)
Inspected By: Date

Revised - 6/28/49

FIG. 1—DAILY AND WEEKLY INSPECTION REPORTS, together with 6-mo report (next page) insure continuous fan service at all times.

All other lights are deenergized, indicating the following:

A. Electric motor off.

B. Underground feeder breaker open.

C. DC breaker open.

When primary power is restored, the equipment will automatically restart and will be as described under normal operating conditions. As the fan motor takes over the drive, the engine will automatically slow down and run at idling speed for 4 min, then stop. The idling period prevents backfiring and dieseling, because the engine cools off during this interval.

As normal conditions are restored, the chimes will sound indicating the change. The signal lights will be normal. Should false or erratic signals be noted, the lamphouse attendant can listen in on the telephone for exact operating conditions.

How Fans Are Protected

All main bearings are equipped with dial-type indicating and con-

TENNESSEE COAL, IRON AND RAILROAD COMPANY
COAL MINING DEPARTMENT

SIX MONTH INSPECTION REPORT - AUTOMATIC FAN STATIONS

1. Gas Engine

a. Full Load Speed of Engine: _____ RPM.
b. No Load Speed of Engine: _____ RPM.

Spark Plugs and Valve Tappet Clearances - Left Side (Facing Radiator)

Cylinder / Valve	No. 1 In. Ex.	No. 2 In. Ex.	No. 3 In. Ex.	No. 4 In. Ex.	No. 5 In. Ex.	No. 6 In. Ex.
c. Cond. Before Adj.						
d. Adj. Clearance						
e. Spark Plugs						

Right Side (Facing Radiator)

Cylinder / Valve	No. 1 In. Ex.	No. 2 In. Ex.	No. 3 In. Ex.	No. 4 In. Ex.	No. 5 In. Ex.	No. 6 In. Ex.
c. Cond. Before Adj.						
d. Adj. Clearance						
e. Spark Plugs						

2. Accessory Equipment

Device	Bearings	Commutator	Brushes	Windings Clean
125 Volt Generator				
12 Volt Generator				
Left Hand Starter				
Right Hand Starter				

Clutch Collector Rings O.K.? _____
Clutch Brushes O.K.? _____ Clutch Lining O.K.? _____
Air Filters Cleaned? _____ Ignition Timing O.K.? _____
Carburetors checked, Cleaned, and Adjusted? _____

Six Month Inspection Report - Automatic Fan Stations — Sheet 2 of 4
G. I. R & M No. 39 - Continued

3. Controls

Device Description and Number	Connections O.K.?	Contacts Clean and O.K.?	Springs Linkages Adjustments O.K.?
Fan Control			
Starting Breaker			
Starting Breaker Aux. Relay X			
Starting Breaker Aux. Relay Y			
Running Breaker			
Running Breaker Aux. Relay X			
Running Breaker Aux. Relay Y			
Running Breaker Aux. Relay Z			
Voltage Relays			
Timing Relays			
Control Relays			
Control Switches			
Bearing Thermostats			
Current Phase Failure Relay			
Voltage Phase Failure Relay			
Thermal Overload Relay			
Overcurrent Relay			
Breaker Aux. Contacts			
Secondary Controls			
Engine Control			
"X" Timing Relay			
Clutch Relay			
Engine Starting Relays			
Synchronizer Control (all)			
Clutch Switch			
"Manual-Auto" Engine Control Switch			
Power Feeder Breakers			
Main Circuit Breakers			
Circuit Breaker Aux. Relay X			
Circuit Breaker Aux. Relay Y			
Overload Relay			
Fan Signals			
Blinker Air Switch			
Alarm Air Switch			
Door Latch Timing Relay			
Power Transfer Relay			

U.G. Feeder Signals: Operation of White Lights in Lamphouse.

D.C. Breaker in _____ D.C. Breaker out _____
U.G. Feeder Breaker in _____ U.G. Feeder Breaker out _____

Six Month Inspection Report - Automatic Fan Stations — Sheet 3 of 4
G.I. R & M No. 39 - Continued

4. Protective Devices

All bearing Relays Tripped Breaker O.K.? _____
Thermal Overload Relays Tripped Breaker O.K.? _____
Value of Current to Trip _____
Overcurrent Relays Tripped Breaker O.K.? _____
Value of Current to Trip _____
Voltage Relays Tripped Breaker O.K.? _____
Door Latch Mechanism Worked O.K.? _____
U.G. Feeder Breaker: _____
Overcurrent Relays Tripped Breaker? _____
Value of Current to Trip _____

5. Signal System

Operation of Signals as Reported by Lamphouse Attendant.

Condition / Signal	Blinker	Red	Siren	Green	Amber
Fan Running					
Fan Stopped					

6. Main Bearings

Bearing	Measured Clearance	Condition of Bearing	Cleaned and Changed Lub.	Repairs and Adjustments
#1 Bearing				
#2 Bearing				
#15 Bearing				
#16 Bearing				

7. Main Belts

Condition of belts: _____

Six Month Inspection Report - Automatic Fan Station — Sheet 4 of 4
G.I. R & M No. 39 - Continued

8. Motor

Rotor Air Gap _____
Windings blown out and cleaned _____
Megger readings to ground _____
Insulation and connections O.K.? _____
Coupling condition and alignment O.K.? _____

9. Remarks: _____

Mine _____ Station _____
Inspected By _____ Date _____
Approved By _____
Surface Maintenance Foreman

CGB:mm
Revised 6/28/49

FIG. 2—SIX-MONTH INSPECTION report for T.C.I. ventilating fans.

tact-making thermometers arranged to lock out the equipment in event of excessive temperatures. All equipment is fully protected against short-circuits, single- or reverse-phase power, sustained moderate overloads, overcranking of the engine, over-temperature, and loss of oil pressure.

Should the fan stop for any reason, the doors will close and the two airflow switches will operate by gravity as a result of lack of vacuum. In the lamphouse, the green "fan-running" lights will be dark, the red "fan-stopped" light will burn, and the siren will sound. The chimes will also signify the change in operation. Immediate steps will be taken to get the fan restarted.

Maintenance and inspection of this system are now performed at each mine by a circuit rider and a helper on one shift only. Complete report forms covering maintenance, inspection and tests for preventive maintenance have been developed. One is filled out daily in duplicate by the circuit rider. One copy is kept on file in the maintenance foreman's office, while the other is on file at the fan station for observation by interested parties. Samples of these report forms are shown in Figs. 1 and 2. Fig. 1 shows the daily form and that used for the more detailed weekly inspections, while Fig. 2 shows the form used for the 6-mo inspection.

The automatic fan signal system described in this article has resulted in better and more reliable maintenance and housekeeping in fanhouses. It also has provided the operating departments with more reliable ventilation at less cost than when attendants were stationed at each fan seven days per week three shifts per day.

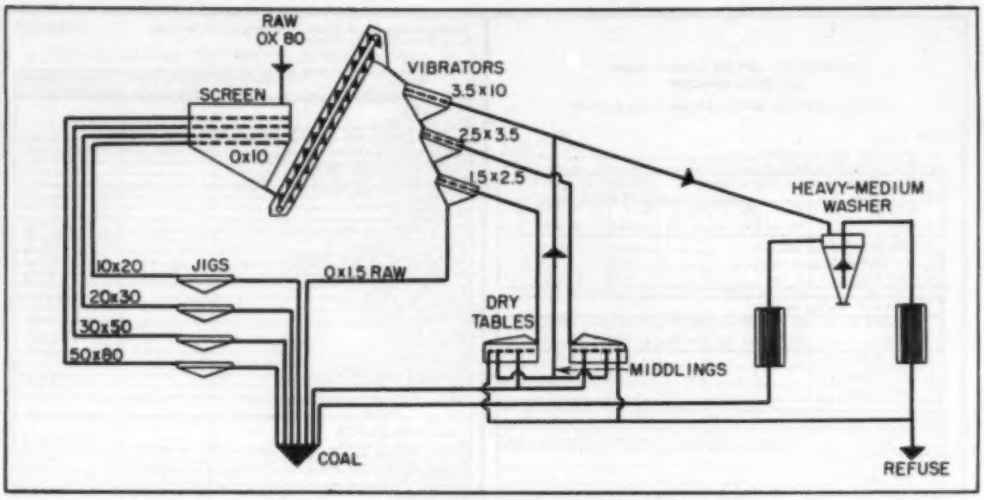


FIG. 1—HOW RAW PRODUCTS are treated in dense-media pilot plant.

Dense-Media Washing of Fines

Goal: Dense-Media Washing Down to 1 MM

Findings: Practicable Within Well-Defined Limits

Results: Installation of Commercial 2x6 Plant

By J. BAUDRY
Managing Director, Charbonnages d'Hensies Pommeroeul, Belgium

TABLE I—Examples of Daily Control-Test Results Showing Stability of Process and Uniformity in Quality

Date	Average Washing Density of the Day	Total Coal Ash	COAL: Float at Density of the Day %	COAL: Float % Ash	COAL: Sink at Density of the Day %	COAL: Sink % Ash
6/23/49	1.53	6.53	93.52	4.00	6.48	43.10
7/ 2/49	1.51	5.52	96.40	4.50	3.60	33.10
8/16/49	1.48	4.69	93.50	3.30	6.50	24.80
8/22/49	1.50	5.65	94.35	4.20	5.65	30.00
9/ 7/49	1.51	7.78	90.60	5.00	9.40	34.60
10/ 8/49	1.50	5.91	95.20	4.60	4.80	32.00
10/29/49	1.52	6.23	93.70	4.50	6.30	32.00
11/29/49	1.50	6.09	93.40	4.30	6.60	31.50
12/ 6/49	1.50	5.08	96.00	4.00	4.00	31.20
2/27/49	1.55	5.84	96.00	4.80	4.00	31.00
			REFUSE			
6/23/49	1.53	74.33	0.40	9.50	99.60	74.60
7/ 2/49	1.51	68.46	2.00	17.60	98.00	69.50
8/16/49	1.48	73.74	0.40	9.00	99.60	74.00
8/22/49	1.50	72.68	1.30	11.00	98.70	73.50
9/ 7/49	1.51	73.61	0.60	9.00	99.40	74.00
10/ 8/49	1.50	72.48	0.80	9.00	99.20	73.00
10/29/49	1.52	72.67	1.00	11.20	99.00	73.30
11/29/49	1.50	72.75	0.40	11.00	99.60	73.00
12/ 6/49	1.50	73.15	0.70	10.00	99.30	73.60
12/27/49	1.55	76.74	0.40	12.60	99.60	77.00

LABORATORY and pilot-plant tests, supplemented by a theoretical study of the problem, indicate that dense-media treatment of coal from 6 down to 1 mm in size can be successfully accomplished in spite of what has been held to be major difficulties. Chief of the difficulties cited as prohibiting dense-media treatment of coal in this size range are:

1. Stokes' law. In accordance with this law—governing the behavior of small particles as a function of the viscosity of the medium—pieces of different densities are difficult to separate in a heavy medium. Consequently, washing is not precise and there is a large loss of coal in the refuse and much refuse in the coal.

2. Because of the fineness of the particles, the washing process is difficult and the medium loss with the finished products (coal and refuse) is very high, increasing the cost of the washing process.

After studying these two principal difficulties and making laboratory tests, we have come to the conclusion that Difficulty No. 1 does not occur in the treatment of sizes from 1 to 10 mm if a suspension of magnetite in water is used for washing densities between 1.4 and 1.7. The laboratory tests showed that the separation of coal and refuse with magnetite as the

medium corresponded exactly with the theoretical washability curve. Moreover, this opinion has been strengthened by a theoretical study of the washing problem, leading to the conclusion that Stokes' law applies only to particles smaller than ½ mm.

As for Difficulty No. 2, the remedy is the proper application of magnetic separators to recover the greater part of the magnetite carried over with the wash water.

These two ideas have encouraged us to install a small heavy-medium washery, with a capacity of 50 tph, for the treatment of the 1- to 10-mm fines previously washed in jigs. With this washery, tests have been carried out on the following sizes: 1.5x5 mm, 2.5x5 mm and 1x10 mm.

The washery purchased for testing work and as a pilot plant for a new 400-tph washery was a Wemco 3-C Mobil-Mill made by the Western Machinery Co. It was installed in the existing washery building and replaced the jigs previously used in washing the 1x10-mm fraction. The unit went into operation at the end of May, 1949, and was arranged so that it could treat all the size ranges between 1 and 10 mm at a feed rate ranging from 0 to 50 tph.

In addition, we can vary the washability curve of the product to be treated at will by combining with it part or all of the 1.5x2.5 and 2.5x3.5-mm middlings from the dry tables. This is indicated in the plant flowsheet (Fig. 1).

Raw 0x80-mm coal is first screened into 50x80-, 30x50-, 20x30-, 10x20- and 0x10-mm fraction. The first four go to jigs for washing, while the 0x10 is elevated to a series of electromagnetic screens for separation into 3.5x10-, 2.5x3.5-, 1.5x2.5- and 0x1.5-mm fractions. The latter is raw dust and is run directly to the final product without washing, while the 3.5x10 is washed in the heavy-medium plant. The 1.5x2.5 and 2.5x3.5 are treated on Birtley dry tables. The middlings from these tables are combined with the 3.5x10 going to the heavy-medium plant.

The heavy-medium unit is preceded by a small double-deck vibrator to remove minus 1-mm material, which otherwise would present difficulties in the ultimate recovery of the magnetite from the medium and separated products. The upper deck is jacketed with 2.44-mm square-mesh cloth; the lower with 1-mm square cloth. The oversize from either of the decks can be fed to the heavy-medium unit. If necessary, however, the smaller oversize fraction (½-mm) can be removed for treatment on a dry table.

Coal and refuse from the heavy-medium unit are discharged to a 3x16-ft vibrating screen divided down the center to prevent mixing. Medium through the feed end of the screen falls into a sump for return directly to the heavy-medium unit by pumping and without other treatment. On the discharge end of the screen, the refuse and coal are rinsed with clear water, and leave the screen free of magnetite and with a moisture of not more than 7 to 8%.

The spray water removes magnetite and fine particles of coal and refuse. The magnetite is recovered and the medium is cleaned by passing the rinse water through two magnetic separators in parallel. Reclaimed magnetite is diluted with water, passed through a densifier and demagnetizing coil, and then is discharged to the sump for return to the heavy-medium unit. The densifier regulates the return of the magnetite to the unit and, thus, the density of the bath.

Test Results—1.5x10-MM

The heavy-medium washery regularly treats the 3.5x10-mm fraction from the first stage in screening 0x10, to which is added 1.5x2.5 and 2.5x3.5 middlings from the pneumatic tables. The discharge from the screen averages 40 tph of 1.5x10-mm, varying 20% above or below in the course of a day. It follows that the maximum can reach 50 tph.

In addition, the variation of the composition of the raw 1.5x10-mm is a function of: (1) variation of the raw 0x80-mm over the day, and (2) the starting and stopping of one or more of the dry tables according to maintenance requirements. In spite of these variations in feed rate, size composition and washability characteristics, we have never found large variations in the ash content of the coal and the refuse, or any increase in tramp material in either the refuse or the coal if the washing density is kept constant.

The separating density has been fixed at 1.50 to obtain clean coal with a low ash content. Normal variation during the day is from 1.48 to 1.52, and between these limits the variation in the ash content of the cleaned coal is negligible. We believe that changes in the ash content of the products are caused by variations in the raw feed and not in washing density.

Under commercial conditions of operation, we calculated the average ash contents of the cleaned coal in the last six months of 1949 as follows: July, 6.87; August, 6.00; September, 6.11; October, 6.58; November, 6.34; December, 5.78. The ash content of the refuse varied between 72 and 74%.

The raw 1.5x10-mm has the characteristics shown in the following:

Size Composition

Size (MM)	Percent	Cumulative Percent
0x0.397	0.45	0.45
0.397x0.51	0.02	0.47
0.51x0.61	0.02	0.49
0.61x0.72	0.02	0.51
0.72x0.80	0.05	0.56
0.80x0.99	0.07	0.63
0.99x1.50	0.25	0.88
1.50x2.08	2.70	3.58
2.08x2.34	1.20	4.78
2.34x2.67	5.30	10.08
2.67x3.07	4.30	14.38
3.07x3.63	17.00	31.38
3.63x4.36	17.80	49.18
4.36x5.44	16.22	65.40
5.44x7.5	22.00	87.40
7.5x10	12.60	100.0

Washability Characteristics

Density	Percent Recovery	Percent Ash
Minus 1.30	3.50	1.00
1.30–1.40	49.20	3.20
1.40–1.50	6.10	16.00
1.50–1.60	2.70	24.00
1.60–1.70	2.40	34.00
1.70–1.80	2.04	40.00
1.80–1.90	2.10	50.00
Plus 1.90	31.96	78.00
Totals	100.00	30.84

For such a product, the summary of the washing results is as follows:

Average test density	1.52
Average ash, cleaned coal	6.04
Actual washing recovery	63.60
Average ash, refuse	74.20
Theoretical washability—	
curve recovery	63.70
Coal floating @ 1.52	92.68% @ 4% ash
Sinking @ 1.52	7.32% @ 32% ash
Total ash	6.04%
Refuse floating @ 1.52	0.30% @ 9% ash
Sinking @ 1.52	99.70% @ 74.40% ash
Total ash	74.20%

Magnetite specifications: 89.20% ferric oxide, 65% iron, 98.60% finer than 70 mesh, 30.36% finer than 250-mesh.

The magnetite loss increases as a direct function of the density of the medium and of the size of the products treated. The smaller the size of the feed the greater is the loss. At a feed rate of 50 tph, the bed on the rinsing screen was 6 in thick, or too thick for satisfactory

drainage and rinsing. Thickness of the coal bed should not be more than 2¾ in, and of the refuse, 2 in. Furthermore, a thickener should be placed in the magnetite-recovery circuit to provide a constant feed to the magnetic separators and to permit more spraying on the screens. Finally, to further increase magnetite recovery, the two magnetic separators should be placed in series rather than in parallel.

Control tests are run on the coal and refuse daily. Stability of the process and uniformity of results are indicated by the figures in Table I, taken at random from tests in the last 6 mo of 1949.

Test Results—1.5x5-MM

Before the successful operation of the washing plant on 1.5x10-mm, we made tests on the 1.5x5 fraction. We concluded that a plant like ours could treat 25 tph of raw 1.5x5 at a density up to 1.65 or 1.70. Above this density it seems from a study of the washing results that the viscosity is too high. Consequently, in spite of reducing the feed rate to 13.3 tph during the test at 1.70, washing results were bad, there was a large loss of coal in the refuse, and the magnetite loss was prohibitive. It should be pointed out immediately, however, that this magnetite loss, as previously noted, could be reduced by increasing the screen surface, additional spraying, installation of a thickener and placing the two magnetic separators in series.

The tests on the 1.5x5 fraction were carried out at densities between 1.50 and 1.70, increasing 0.5 each time. Each test lasted about an hour. As they were carried out at different times of the day, we thought it necessary to take samples each time to examine the size range and washability. However, in Tests 1 and 2 (at 1.50 and 1.55) no great difference was noted in size range and washability of the raw coal. Consequently, we adopted the same washability curve for the two tests.

The raw 1.5x5 was obtained by changing the cloths on the electromagnetic screen. In addition, the cloths on the vibrator immediately in front of the washing cone were changed to obtain the closest sizing possible. It should be remembered that the screen has an upper deck dressed with 2.44-mm square-opening cloth, a lower deck dressed with 1-mm square, and a slope of 25 deg.

The raw 1.5x5 tested at 1.50 and 1.55 has the following characteristics:

Size Composition

Size (MM)	Percent	Cumulative Percent
0x0.51	1.10	1.10
0.51x0.80	0.45	1.55
0.80x0.99	0.20	1.75
0.99x1.5	4.70	6.45
1.5x2.08	18.30	24.75
2.08x2.34	4.35	29.10
2.34x2.67	17.00	46.10
2.67x3.07	9.50	55.60
3.07x3.63	23.50	79.10
3.63x4.36	16.50	95 60
4.36x5.44	3.90	99.50
Plus 5.44	0.50	100.00

Washability Characteristics

Density	Percent Recovery	Percent Ash
Float 1.30	18.30	1.00
1.30–1.40	35.94	3.00
1.40–1.50	7.00	14.80
1.50–1.60	4.60	25.20
1.60–1.70	3.10	33.80
1.70–1.80	2.90	45.00
1.80–1.90	2.56	51.00
Sink 1.90	25.60	80.00
	100.00	27.62

The washing results were:

Density 1.5 ± 0.00

Raw feed.....25 tph @ 27.50% ash
Coal, total ash.....5.73%
Float @ 1.5.....93.80% @ 4% ash
Sink @ 1.5.....6.20% @ 32.00% ash
Refuse, total ash.....72.53%
Float @ 1.5.....0.40% @ 6.20% ash
Sink @ 1.5.....99.60% @ 72.53% ash
Actual washing recovery.....67.4%
Theoretical washing recovery @ 5.73% ash.....67.7%

Density 1.55 ± 0.01

Raw feed.....22.23 tph @ 27.50% ash
Coal, total ash.....6.48%
Float @ 1.55....94.56% @ 4.80% ash
Sink @ 1.55.....5.44 @ 35.80% ash
Refuse, total ash.....75.39%
Float @ 1.55....0.76% @ 21.80% ash
Sink @ 1.55...99.24% @ 75.80% ash
Actual washing recovery.....69.5%
Theoretical washing recovery @ 6.48% ash.....68.2%

Washing results on the 1.5x5-mm fraction at 1.60, 1.65 and 1.70 (similar size and washability characteristics) were as follows:

Density 1.60 ± 0.01

Raw feed.....23.79 tph @ 31.13% ash
Coal, total ash.....6.63%
Float @ 1.60.....95.54% @ 5% ash
Sink @ 1.60.....4.46% @ 41.70% ash
Refuse, total ash.....69.19%
Float @ 1.60....2.36% @ 23.30% ash
Sink @ 1.60....97.64% @ 70.30% ash
Actual washing recovery.....60.8%
Theoretical washing recovery @ 6.63% ash.....65.0%

Density 1.65± 0.01

Raw feed.....21.86 tph @ 31.73% ash
Coal, total ash.....9.51%
Float @ 1.65.....94.60 @ 7.20% ash
Sink @ 1.65.....5.40% @ 50% ash
Refuse, total ash.....74.26%
Float @ 1.65....2.32% @ 23.00% ash
Sink @ 1.65....97.68% @ 75.60% ash
Actual washing recovery.....65.6%
Theoretical washing recovery @ 9.51% ash.....66.5%

Density 1.70 ± 0.01

Raw feed, 13.295 tph. We noticed that with a feed of about 25 tph the separation of the coal and refuse was not regular. The feed floated on the surface of the cone without being wetted and formed compact balls. As the rate was reduced, this trouble diminished and disappeared at about 15 tph.

Coal, total ash.....13.44%
Float @ 1.70.....87.60% @ 6% ash
Sink @ 1.70.....12.40% @ 66% ash
Refuse, total ash.....70.37%
Float @ 1.70.....12% @ 14.40% ash
Sink @ 1.70.....88% @ 78.00% ash
Actual washing recovery.....65%
Theoretical washing recovery @ 13.44% ash.....70%

For the record, we have calculated the washability curve of the washed coal and the refuse, as indicated in the following table:

	Washed Coal		Refuse	
	%	% Ash	%	% Ash
Float 1.30	33.06	1.20	3.30	1.00
1.30–1.40	37.44	4.75	3.95	5.00
1.40–1.50	8.44	18.10	1.30	17.00
1.50–1.60	5.50	27.15	1.54	27.40
1.60–1.70	3.80	36.40	2.21	38.00
1.70–1.80	2.30	44.20	3.27	45.00
1.80–1.90	2.06	51.25	5.08	55.00
Sink 1.90	7.40	73.70	79.35	80.00
	100.00	13.90	100.00	69.45

Comparing the figures in the preceding table with the washability curve of the raw coal (Fig. 4) and taking into account the theoretical washing recovery (70%), it will be noted that the dispersion is high. This is a result of the high viscosity of the medium at a density of 1.70. One could, perhaps, reduce the viscosity by coarser grinding of the magnetite.

Dispersion Study

Washing in Heavy Media v Water—To determine the efficiency of heavy-media washing compared to water washing, we made the series of tests described below. For water washing, we chose the standard jig, as we considered it very efficient. Also, it gives the least dispersion of any of the water-washing machines known at the present time. Although we could have made similar tests with dry cleaning on pneumatic tables, we did not wish to make any comparison with this type cleaning as

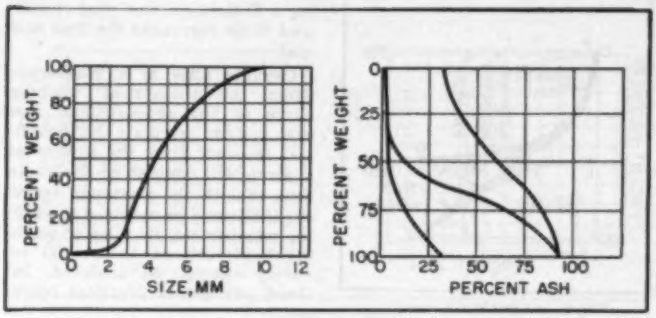


FIG. 2—SIZE CURVE, average raw 1.5x10-mm, left, and washability curves, right.

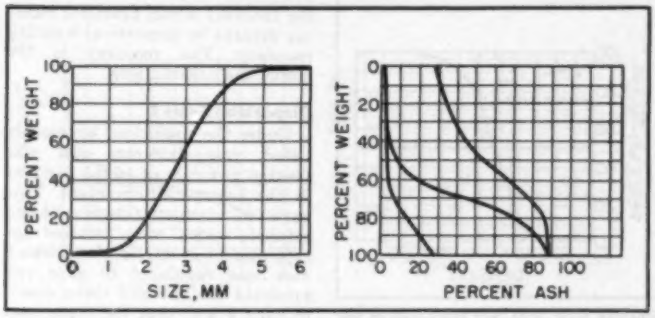


FIG. 3—SIZE CURVE, raw 1.5x10-mm, washing tests at 1.50 and 1.55, left, and washability curves, right.

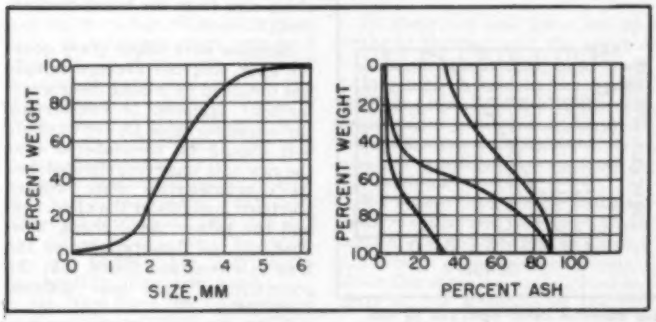


FIG. 4—SIZE CURVE, raw 1.5x10-mm, washing test at 1.70, left, and washability curves, right.

it is known to have a very high dispersion.

As will be seen from the data to be presented, jig washing, in spite of its simplicity, provides very acceptable results. However, we must add that the jig was perfectly adjusted before samples were taken. In addition, operation and adjustment of controls took the full time of an engineer and the washery foreman throughout the test. Finally, as noted later, the feed to the jig was completely free of undersize and slimes. On the other hand, no particular steps were taken to prepare or supervise the heavy-medium washer during the tests.

To get an exact comparison between the two washing systems, we were obliged to:

1. Treat in the two installations the same raw coal with the same washability curve.

2. Obtain the same washing results in terms of coal; i.e., the same ash content.

To reach the first objective, the raw 2x10-mm from the vibrating screens was first washed in the heavy-medium plant. On leaving the rinsing screen the coal and refuse were combined. This reconstituted feed was fed to the jig at the rate of 15 tph. We were, therefore, sure that the feed to the two installations was identical except for the fact that the first wash in the heavy-medium plant eliminated all the undersize and the slimes. Therefore, the jig received a raw feed minus this undersize and slimes.

TABLE II—Data for Construction of Dispersion Curve

	Raw (a)	Washed (b)	Refuse (c = a − b)	Ratio Refuse Raw (c÷a)
Minus 1.30	18.22	18.18	0.04	0.22
1.30–1.40	33.75	33.57	0.18	0.53
1.40–1.50	5.29	5.20	0.09	1.70
1.50–1.60	3.09	2.25	0.84	27.10
1.60–1.70	2.64	1.00	1.64	62.10
1.70–1.80	2.19	0.32	1.87	85.40
1.80–1.90	1.42	0.12	1.30	91.50
Plus 1.90	33.40	0.36	33.04	98.90
	100.00	61.00	39.00	

The Dispersion Principle—Dispersion, as the name indicates, shows graphically the distribution of the various constituents of the mine-run coal in the cleaned coal and refuse. At the same time, it indicates the efficiency of the washing apparatus.

Tromp originated the idea of the dispersion graph. Taking a sample of the mine-run and of the washed coal or refuse, he treated these samples at a series of different densities and weighed each fraction. For each density he calculated the percentage of floats and sinks in the raw coal recovered in the washed product and in the refuse at the same density. The graph was drawn by plotting the densities as abscissas and the percentages as ordinates.

The actual dispersion curve for one test described later, and based on the data shown in Table II, is given in Fig. 5. On cutting the curve horizontally at 50% one obtains on the abscissa the theoretical separating density. To the left of this density and under the dispersion curve is found the error coal in the refuse. At the right and above the curve is the error refuse in the coal.

This dispersion curve can be integrated with the Gauss bell curve. These integral curves are characterized by their probable errors. With the dispersion curve the

Dispersion Tests Demonstrate Dense-Medium Efficiency

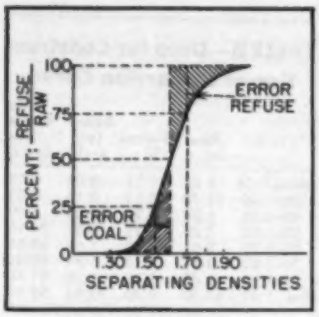


FIG. 5—DISPERSION curve.

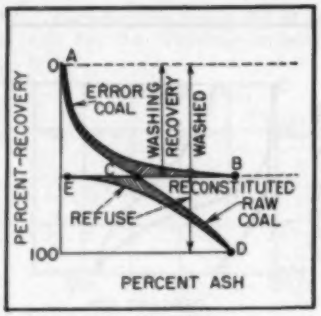


FIG. 6—WASHABILITY curves.

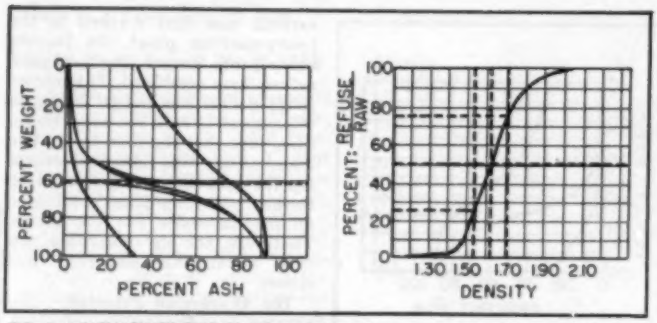


FIG. 7—WASHABILITY CURVES, left, and dispersion curve, right, first heavy-medium test.

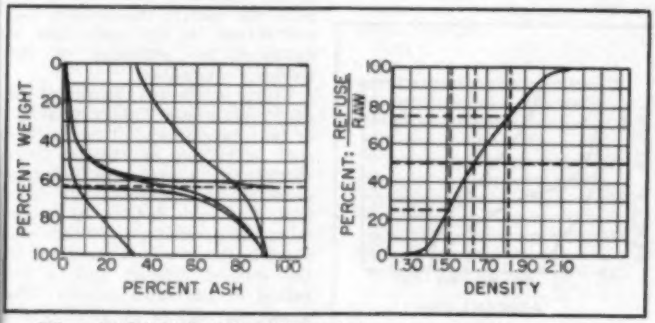


FIG. 8—WASHABILITY CURVES, left, and dispersion curve, right, first jig test.

probable error will be the weight error between the densities of the mine-run fractions between the 75-50% ordinates and the 50-25% ordinates. As these two probable errors are not equal, Tromp generally uses the mean value, which is called the "mean probable error." This mean probable error, therefore, becomes a characteristic of the type of washing plant.

It has been shown, for the same apparatus and the same size range of treated product, that the dispersion curve is independent of the coal and of the density of separation. It represents, to some extent, the characteristic curve of the washery.

Estimating Dispersion from Washability Curves — By taking samples of the raw coal, the washed coal and the refuse, and plotting the washability curves of each of these products as shown in Fig. 6, one can estimate the dispersion (error refuse in the coal and vice versa) and determine the efficiency of the washery. For a perfect result the washability curve of the raw coal is made by separating the constituents of the clean coal and refuse, reconstituting a theoretical raw coal considered to be very near the true raw coal.

Organic Loss in a Washery—From the theoretical washing curve of the reconstituted raw coal, one can calculate the theoretical recovery from the washer at a given ash content of the clean coal, that is, the maximum recovery that could be obtained if washing was perfect. Because of washing imperfections, theoretical recovery cannot be achieved. Instead, one gets a practical recovery.

The organic loss in a washery is P_{os}, which equals theoretical washing recovery minus practical washing divided by theoretical washing recovery. The recovery is 100 minus the organic loss.

Dispersion Tests I

Under the conditions previously listed, raw 2x10-mm coal was treated at a rate of 16 tph for 2 hr in the heavy-medium plant. This gave two products (clean coal and refuse), which were remixed for retreatment in the jig plant, which also was regulated to give two products (refuse and clean coal), in such a way that the clean coal had an ash content approximately equal to the ash content of the clean coal from the heavy-medium plant.

Samples were taken every quarter hour, and the average sample was obtained by mixing these quarter-hour samples. In considering the results—Table II, for example—it should be remembered that the raw coal was reconstituted, i.e., its characteristics were worked out from analysis of the clean coal and the refuse. As a check, however, we ran density tests on the true raw coal and found that the reconstituted raw coal differed very little.

Heavy-Medium Washing—Density was maintained at about 1.5. The finished coal contained about 6.12% ash, and the refuse 75.80% ash. The washing recovery was 61%. Fig. 7 shows the washability curves (reconstituted raw coal, clean coal and refuse), and the dispersion curve based on the test results shown in Table II.

Jig Washing—The clean coal contained 8.86% ash and the refuse 75.06% ash during this test. Recovery was 62.50% (Fig. 8).

Dispersion Tests II

A second series of tests were conducted to determine if the char-

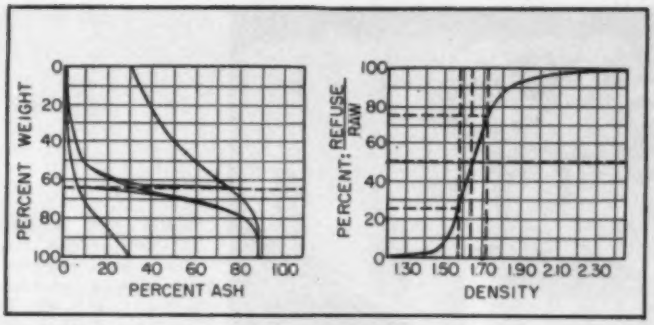


FIG. 9—WASHABILITY CURVES, left, and dispersion curve, second heavy-medium test.

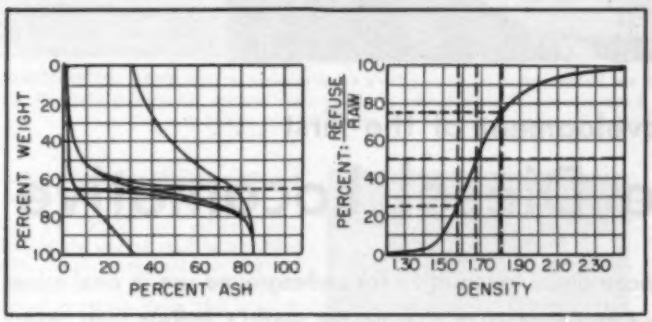


FIG. 10—WASHABILITY CURVES, left, and dispersion curve, right, second jig test.

acteristic curves obtained in each type of washing plant remained constant. In these tests, lasting 2 hr, the average feed was 15 tph. The tests were carried out several days later and at a different time of day. It follows that the coal changed somewhat.

Heavy-Medium Washing — Density was maintained at about 1.50. The coal contained 6.09% ash and the refuse 74.45% ash. The recovery was 64.50%. Fig. 9 gives the washability dispersion curves.

Jig Washing—The jig produced coal containing 6.88% ash and refuse containing 74.42% ash. The recovery was 65.10%. Fig. 10 gives the dispersion and washability curves.

Test Results—Results of the tests are summarized as follows:

Jig	First Test	Second Test	Average
Separating density	1.650	1.675	.....
Probable average variation	0.150	0.115	.....
Organic loss (%)	3.8	2.1	2.95
Organic recovery (%)	96.20	97.90	97.05
Heavy-Medium			
Separating density	1.615	1.645	.....
Probable average variation	0.0825	0.0750	.....
Organic loss (%)	0.8	0.7	0.75
Organic recovery (%)	99.20	99.30	99.25

If, therefore, one takes the average of the two tests, the organic loss in the jig is 2.20 percentage points higher than in the heavy-medium plant. In other words, for each ton of coal washed, one obtains 48.5 lb more coal by heavy-medium washing as compared to jig washing.

We repeat that the jig was specially supervised during these tests and that generally, in normal practice, the loss is much greater, since the operator cannot concentrate all his attention on the jig.

Conclusions

1. The washing of 1- to 10-mm coal in a heavy-media plant using magnetite as the medium is possible within well-defined limits.

2. To avoid excessive dispersion, it is recommended that the washing density not exceed 1.70.

3. For the same washing equipment, a reduction in size has the following effects: (a) reduces the hourly capacity of the plant; (b) increases magnetite consumption.

4. Removal of the minus 1-mm slimes and wetting of the feed before introducing it into the separating unit is recommended in washing fine sizes to avoid surface-tension problems.

5. To reduce magnetite loss, the following should be observed:

A. Size of the drainage and rinsing screens should be adjusted so that the thickness of the material bed (coal, refuse or middlings), does not exceed 1.2 to 1.6 in.

B. Rinsing on the rinsing screens should be carried out with large quantities of high-pressure water.

C. It is advisable to provide a thickener to receive the rinse water containing slimes and magnetite and produce a clear-water overflow. This thickener would permit thorough rinsing without increasing the number of magnetic-recovery separators used.

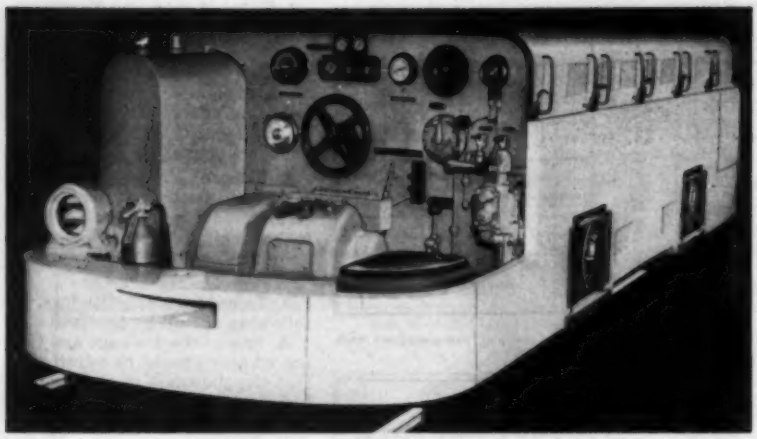
D. The magnetic separators should be placed in series.

6. The accuracy of the heavy-medium separator is such that the middlings generally are not produced. The lighter middlings go with the coal and the heavier with the refuse. This point should, however, be considered with the reservation in Item 2.

7. To raise the density limit and avoid the troubles caused by the viscosity of the medium, it is recommended that the magnetite be less-finely ground.

The Mobil-Mill continues to provide satisfactory results after 2 yr of operation and regularly treats 15,000 tons per month while maintaining the operating stability and quality shown in Table I. This, I believe, is worth emphasizing in view of the fact that we have experienced important variations in raw-coal characteristics.

In view of the satisfactory results provided by this plant, we decided to install a new unit with a capacity of 200 tph for washing 6x80-mm and another 100-tph unit for 2x6-mm, with the possibility of reducing the size to 1x6. These two plants, supplied by the Western Machinery Co., also will utilize heavy-medium washing and were scheduled to go into operation in August, 1951.



READY FOR UNDERGROUND SERVICE, this first American permissible locomotive has passed the most-rigid safety tests in the world. Rated at 10 tons and powered by a 100-hp engine, top speed is 10 mph. The controls are within easy reach and vision of operator.

The Story of the Development of the First . . .

Permissible Diesel Locomotive

HERE'S HOW the first American diesel locomotive for underground use in coal mines came into being and achieved approval after passing the world's stiffest tests. Here also are the safety and operating advantages of the mine-haulage unit—already widely used abroad—you will be using in the days to come.

By GORDON MACVEAN
President, National Mine Service Co., Pittsburgh, Pa.

ON MAY 8, 1951, the U. S. Bureau of Mines issued Approval No. 2201 to the National Mine Service Co., of Beckley, W. Va., to cover its design of a 10-ton diesel haulage locomotive. This was the first approval issued to any manufacturer under Schedule 22 of the U. S. Bureau of Mines, first published Sept. 2, 1944.

The development of Schedule 22 was commenced by technicians of the Bureau of Mines in 1937, and complete investigation of the foreign use of diesel underground haulage equipment was carried out in the ensuing years. The bureau technicians concluded that the use of diesel haulage equipment in U. S. coal mines would represent a sizable forward step in underground safety. But, to make certain of the inherent safety of the locomotive unit itself, a schedule was drawn up containing restrictive provisions far in excess of those embodied in the schedules established in other coal mining countries, such as, England, France, Belgium and Germany, where there are today many hundreds of diesel locomotives in daily use underground, and where the trend is definitely toward increased use of diesel haulage equipment. No better evidence of the tightness of Schedule 22 can be offered than the fact that it was better than 6½ yr later before an American manufacturer succeeded in developing a design that adequately met all the high standards of performance required by the schedule.

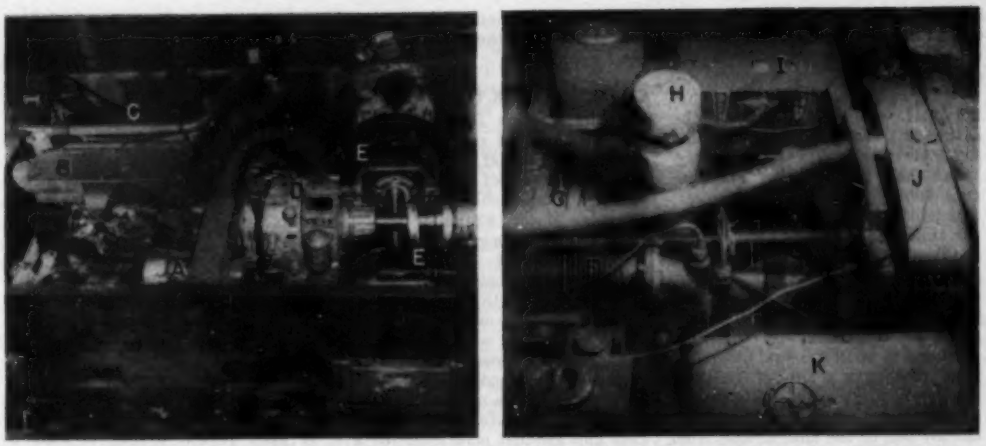
WHAT THE SCHEDULE REQUIRES

To appreciate more fully how carefully the U. S. Bureau of Mines drew up the requirements of Schedule 22 to make certain that the underground use of a permissible diesel locomotive would be entirely safe from every possible viewpoint, consider a few of the more pertinent requirements, as follows:

1. Under normal operating conditions, and within the rated-output range, the *undiluted* exhaust gas of the engine shall not contain more than 0.25% of carbon monoxide by volume. Provision must be made to dilute the exhaust gas with air *before* it is discharged from the locomotive into the surrounding atmosphere. *Dilution* shall be such that the discharged exhaust gas and air mixture shall not contain more than 0.001% by volume of carbon monoxide, 0.00025% by volume of oxides of nitrogen, or 0.0001% by volume of aldehydes under *any* condition of operation: that is, with idling engine, and with engine at half load, full load, or whatever.

2. A cooling system must be provided for the exhaust gas of the engine so designed that the temperature of the *undiluted* exhaust gas shall never exceed 160 F at the point of discharge from the cooling system of the engine under any condition of operation.

3. The temperature of the external surfaces of the exhaust system



CONSTRUCTION VIEWS show: A, explosion-tested starting motor; B, intake manifold and flame arrester; C, water-cooled exhaust manifold; D, torque converter; E, enclosed chain guards; F, exhaust duct; G, explosion-tested battery-charging generator; H, air cleaner; I, battery box for starting and lighting; J, radiator; K, exhaust-gas conditioner.

shall not exceed 400 F under any condition of engine operation.

4. The intake and exhaust systems of the engine shall be provided with flame arresters to prevent propagation or egress of flame or heated particles from the exhaust and intake system to a surrounding flammable atmosphere.

5. The intake and exhaust systems shall be of such construction that they will withstand internal pressures of 125 psi, or such internal pressures as may be developed within them in explosion tests with gas-air mixtures, *whichever is the greater.*

6. All joints in the intake and exhaust systems shall be formed by flanged metal-to-metal contacts designed in accordance with requirements for other (mostly electrical) types of explosionproof equipment.

7. The fuel-injection system of the engine shall be so constructed that the mechanism controlling maximum fuel injection may be definitely fixed, with adjustment only by breaking a seal on a locked compartment or by altering design. If the carbon-monoxide content of the undiluted engine exhaust does not exceed 0.25% by volume throughout the rated range of speeds and power outputs, the setting of the fuel-injection equipment by the manufacturer will be considered acceptable.

8. The fuel used for diesel locomotives in underground service should conform to the manufacturer's specifications, but the flash point must not be less than 150 F, and the sulphur content must not exceed 0.2% by weight. It is recommended that fuel be taken underground only in a strong, tight tank mounted on a car and equipped with a flexible hose, and a suitable arrangement for transferring the fuel from the tank car of the locomotive. It also is recommended that tank cars should be taken underground only when required to fill the fuel tanks of locomotives and should be removed from the underground workings immediately thereafter.

FLAME ARRESTER in front of exhaust conditioner (left) prevents spark or flame emission in locomotive operation.

In addition to the preceding requirements, Schedule 22 emphasizes adequate maintenance and periodic inspection. The manufacturer is required to furnish an instruction manual to each locomotive user, the contents of which are reviewed and approved by the bureau. This manual provides complete instructions covering the operation and servicing of the locomotive, with particular reference to proper adjustment and maintenance of the engine and its auxiliaries as an aid to minimizing the production of smoke and toxic gases in the exhaust and to maintaining flame arresters and flameproof equipment in proper condition.

THREE YEARS FOR DEVELOPMENT

With distinct recognition of the fact that no problems easy of solution lay ahead, the National Mine Service Co. reached the decision to embark on the development of a permissible diesel locomotive some 3 yr ago. It required nearly a year to prepare preliminary design layouts, which were then disclosed to the engineers of the electrical and mechanical section of the U. S. Bureau of Mines. Sufficient encouragement was offered so that after some test work of an experimental nature at the Bruceton Station it was decided to send the first letter of application to the director of the U. S. Bureau of Mines on July 21, 1949. Shortly thereafter, test work on the first engine, exhaust gas cooler, flame arresters and other components was commenced.

The first engine submitted was a standard 4-cylinder 100-hp unit. The test program on the engine, and the exhaust conditioner designed to operate in with it, occupied about 5 mo. Both the engine and the exhaust-gas cooler failed to meet the

specified requirements in a number of respects. Exhaust-gas manifold temperatures exceeded 400 F despite the fact that a specially developed water-cooled cast-aluminum manifold was substituted for the standard cast-iron water-cooled unit. A change in fuel injectors, which had the effect of reducing the developed engine horsepower, was tried with beneficial results, but not sufficiently better to accomplish the desired result.

Explosion tests with the engine, exhaust-gas cooler and flame arrester, together with other auxiliaries, all connected as they were intended to be in the final assembly, gave rise to a series of failures. Ignitions in the explosion galleries resulted from blown-out gaskets in the air box of the engine, and from cracks in the welded joints of the exhaust-gas cooler, the latter a result of "pressure-piling" in the welded box. It should be noted here, however, that the engine, as presented to the Bureau, fell short of Schedule 22 requirements in a number of respects. For example, gaskets were used in the air-box covers, the covers themselves were made of thin stamped pieces, and the flange widths were less at numerous points than required by the schedule as written.

After the failure of the first series of tests on the design of locomotive initially submitted, the Bureau of Mines called a meeting of all interested diesel-engine builders to discuss the provisions of Schedule 22 as it affected the engine manufacturers. Many manufacturers took the position that no diesel locomotive would or could ever be approved for underground coal-mine use unless certain requirements were relaxed or made less restrictive.

It was pointed out that the dimensional requirements on enclosure casings were set up on the basis of experience with electrical equipment rather than internal-combustion engines, and that special consideration should be given to the differences in the construction features of internal-combustion engines of the diesel type. As an example, the requirement that the total width of a joint measured along the shortest path from inside to outside of an enclosure shall be not less than 1 in placed an undue hardship on practically all manufacturers and precluded many from participating in the program unless new diesel-engine designs were developed. Despite these and other related factors, bureau officials remained firm in their opinion that the provisions of the schedule should not be changed.

CHANGES SPARK NEW START

National Mine Service had, at that point, about reached the conclusion to write off its development expense and direct its engineering effort into other channels when the Hercules Motors Corp., of Canton, Ohio (whose representatives had been present at the Pittsburgh meetings previously referred to), came forward with an offer to participate in the development program. Hercules was prepared to make some changes in its standard engine if National Mine Service would assume the problem of developing and manufacturing the intake and exhaust manifolds for attachment to the engine. If this were to be done, a completely new design of exhaust-gas cooler would have to be evolved.

To make a long story short, a new joint program was embarked upon in mid-1950 and, within a few months, as a result of concentrated and expedited effort on the part of both organizations, it was possible for National Mine Service to submit a completely revised design which met the requirements of the existing schedule in all respects, including explosionproof flange specifications, and which, over a period of many months of exhaustive tests, finally resulted in the award of the first approval.

The first permissible diesel locomotive was built at the Bemeco Div. of National Mine Service, Beckley, W. Va., and was placed on exhibition at the American Mining Congress Coal Show, at Cleveland, last May, and was delivered directly therefrom to Bartley No. 1 mine of the Pond Creek Pocahontas Co., Bartley, W. Va. It weighs 10 tons and is powered by a 100-hp 6-cylinder 4-cycle Hercules diesel engine of the solid-injection compression-ignition type, the compression ratio being 15.5:1.

The engine offers its power directly to a Twin-Disc hydraulic torque converter which provides starting-torque ratios up to 5.8:1, thus facilitating a slow but smooth and sure movement of a loaded trip without wheel slippage. The torque-converter shaft furnishes its power to a chain drive on the axles through a gear box with a 6.2:1 ratio, forward or reverse. The locomotive is designed for a speed of 10 mph at full load, but this can be reduced if desirable.

Preliminary indications from use at Bartley make it appear probable that a considerably higher (up to 34% or 35%) factor of cohesion may be employed in computing available drawbar pull. This results from the use of a hydraulic torque converter for conveying the power from the engine to the wheels. Because of the high torque-multiplication factor involved, close control of output torque permits operation of the locomotive up to the slipping point of the wheels so that, when increased cohesion is required between wheels and rails, sanding may be employed without concern over insulating effects. With a higher percentage of sprung weight, roadability and riding qualities are much improved. While the results are not yet conclusive, there is good reason to believe that a diesel locomotive of the design now used may have greater haulage capacity than an electric trolley locomotive of similar weight.

The over-all length of the present design is 17 ft 3 in. Width is 5 ft 6 in. Over-all height is 45½ in with 42-, 44- or 48-in track gages. With a 36-in track gage, the height must be increased somewhat. The wheel base is 75 in. A Westinghouse air brake system supplies full air control in braking and blown air sanding.

The present design lends itself nicely to tandem operation for a combined weight of 20 tons and a set of controls that can be adequately handled by one operator. With the general trend towards heavier haulage loads in coal mines, it is felt that tandem operation of this type of locomotive will prove quite popular. Design can be so arranged that separable operation of the two 10-ton units can be accomplished.

ALL REQUIREMENTS MET

The locomotive, of course, met all the requirements for permissible manifold temperatures of exhaust gases, dimensional requirements of flange widths and bolt spacing, and developed no gallery explosions in either static or flowing mixtures of natural gas and air (9%). Additionally, it also passed all the tests for electrical components, including starting motor, generator, control box, headlight switch box, and meter box, as well as headlight. Following are some of the more pertinent results with respect to quality of exhaust gases:

1. Samples of exhaust gas taken 10 in in front of the radiator analyzed 0.009% carbon monoxide with

the engine idling; 0.003% carbon monoxide at partial load; and 0.004% carbon monoxide at full load, none exceeding the permissible limit of 0.010%.

2. Samples similarly taken with the throttle wide open and the wheels stalled indicated a carbon-dioxide content at 0.46% against a permissible limit of 0.5%; nitrogen dioxide at 13 parts per million, against a limit of 25; and aldehydes at 2 parts per million against a limit of 10.

To keep the motorman informed at all times concerning the operating condition of his locomotive and to give him adequate warning of any changes that might affect performance and consequent complete safety of operations, the following instruments and controls are located on a panel in front of the motorman's seat:

1. Intake vacuum indicator to define the vacuum on the air-intake side of the engine.

2. Lube-oil viscometer for determining the viscosity of the engine lubricating oil.

3. Lube-oil pressure gage for determining pressure of engine lubricating oil.

4. Oil temperature for the torque converter.

5. Oil pressure for the torque converter.

6. Exhaust temperature indicator. (In addition, a separate air-whistle signal is installed which operates any time the surface temperature of the exhaust pipe approaches the maximum limit of 400 F.)

7. Ammeter to show charge and discharge currents of the battery.

8. Air pressure: both air receivers and brake cylinder.

9. Starter control.

10. Air horn.

11. Headlight switch.

12. Sand valves.

13. Forward-reverse lever.

14. Throttle.

15. Fuel shut-off.

16. Air shut-off. (This is interlocked with the fuel shut-off. The air shut-off cannot be moved until the fuel is completely shut off.)

17. Clutch valve (mechanical clutch used only when shifting for change of direction).

18. Brake valve.

19. Fuel gage.

The fuel-oil tank has a capacity of 28 gal, more than sufficient for two shifts of full operation. Water tanks for supplying the requirements of the exhaust-gas cooler and spray system have sufficient capacity to take care of heavy-duty cycles of operation over two shifts.

THE DIESEL PRINCIPLE

It possibly should be said here that many misconceptions appear to exist concerning the comparative ignition and combustion characteristics of gasoline and diesel engines. Gasoline engines can only function with high fuel-air ratios (the fuel-air ratio is simply the number of pounds of fuel consumed per pound of air) and relatively low compression ratios. Such being the case, relatively rich mixtures of gas are fed to a gasoline engine and many products of partial combustion result therefrom, the most important of which is carbon monoxide.

Gasoline engines should never be used underground in coal mines. On the other hand, diesel engines perform with low fuel-air ratios and relatively high compression ratios. Complete combustion is thus assured. The diesel engine as used on this permissible locomotive contains no spark plugs or other ignition media, the ignition being caused by the heat of compression of the air in the cylinder. It should again be emphasized that Schedule 22 of the Bureau of Mines requires that the fuel pump be set permanently by the manufacturer to limit the fuel injected at full throttle so that the carbon-monoxide content does not exceed 0.25% by volume (raw gas directly at the exhaust outlet before reaching any diluting medium) throughout the rated range of speed and power output. The setting made on the locomotive which passed the bureau's tests was suitable for altitudes up to 2,000 ft above sea level. From the standpoint of exhaust gases, there is no question concerning the inherent safety of operation underground of a permissible diesel locomotive.

It is axiomatic that all mining equipment carrying the approval plate of the U. S. Bureau of Mines should be subject to continual inspection and sound maintenance. The manufacturer has provided all the indicating instruments to determine engine condition, efficiency, etc. Consequently, inspection procedure can be simplified, but the diesel engine automatically offers information as to when it may need attention in a manner entirely different from electrical equipment. As soon as there is the slightest imperfection in the injection or combustion system, more aldehydes are produced. While annoying, these odors are not dangerous, but they do serve as a warning and should indicate to the motorman the need for reporting the condition, which then will readily lend itself to correction by a trained mechanic following the detailed instructions furnished by the manufacturer.

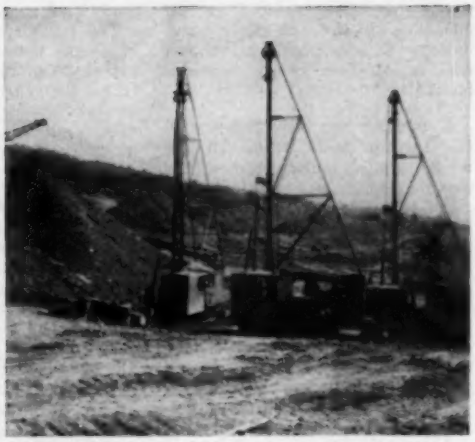
DIESEL OPERATING ADVANTAGES

The purpose of this article is to tell the story of the development of the first permissible diesel locomotive. Because of insufficient experience to date, it is not feasible to lay stress on the decided economies of operation that seem to be one of the attendant advantages to be gained from the use of this type of haulage locomotive. The lack of need for trolley wire, rail bonding, additional power-conversion equipment and other factors, aside from the direct comparison of operating costs, make it appear that diesel-powered main-line haulage equipment does have a place in the modern coal mine of today.

The U. S. Bureau of Mines has long been interested in promoting the use of permissible diesel-powered main-line haulage locomotives, although it has not yet indicated its desire to include gathering service in that category, despite the fact that diesels are so used in other countries. The fatality records maintained by the Bureau are replete with examples of electrocutions through contact with bare trolley wires (22 fatalities in 1949 from this cause alone); with examples of fires caused by bare wires touching doors, curtains, brattice, etc.; and with examples of fires and explosions caused by ignitions of gas, coal and/or other flammable materials as a result of arcs or sparks from poor or broken rail bonds, poor rail joints, or falls of roof or coal bringing the trolley wire in contact with steel cars or rails.

It is hoped that the use of permissible diesel locomotives underground in our coal mines will represent a definite advance in mining practice, from the standpoints of both safety and economy of operations.

UPPERMOST VEIN at Newport is a long narrow tip of the George, stripped by this 4-yd electric dragline and 6-yd diesel.



WELL DRILLS sink 9-in holes on 18-ft centers through hard overburden after softer material is removed.

HIGH EXPLOSIVE in 50-lb cartridges is primed with detonating cord for overburden blasting. Normal shot consists of about 20,000 lb of explosive in 12 holes.

LAWRENCE BISCONTINI, Newport president and general manager.

Shock-Absorbing Stockpile and Sound Planning Mark . . .

Multiseam Anthracite Stripping

Do You Have to Have Equipment Snarls, Spoil Rehandling and Maintenance Bottlenecks?

Newport Excavating Finds You Don't, Even in Stripping Five Pitching Anthracite Seams, if Management and Engineering Effectively Coordinate Operations and Provide for Sudden Peak Market Demands.

CONTROLLING AND COORDINATING production operations at a multiseam anthracite stripping and achieving maximum recovery of the coal underlying the property are prime concerns of the management of the Newport Excavating Co., Nanticoke, Pa., headed by Lawrence Biscontini, president and general manager. This involves, at its operations on the property of

WALKING-TYPE DRAGLINE with 4-yd bucket works with 4-yd electric unit to recover 9½-ft George seam under 95-ft cover.

LAST CUT in West-Ross-seam pit permits access road to be built for pit-loading of 10-ton trucks by 1¼-yd shovel.

GOOD HOUSKEEPING and modern maintenance facilities, striking features of the service area, result in better equipment performance and increased economy.

the Glen Alden Coal Co., the following:

1. Planning the sequence of operations and coordinating the work in several pits on the southern slope of Newport Mountain to get the best possible performance out of the equipment on the job.

2. Insuring that overburden removal is far enough in advance of coal demand that sudden calls for high production will not jolt smooth operation or scramble equipment assignments.

3. Conducting open-pit mining in a manner that will permit deep mining into the highwall when stripping has reached the economic limit, thus resulting in highest possible recovery from the property.

4. Scheduling and executing complete overhauls for more than 50 earth-moving, drilling and haulage units, and controlling the inventory and use of spare parts for these units.

Seams now being mined for Glen Alden are the Bottom Red Ash, Ross, Twin, Kidney and George. The Bottom Red Ash, which is the deepest seam, outcrops highest on the mountain and dips south into the valley. The overlying seams outcrop at lower elevations on the mountainside in the order previously listed.

The general stripping plan calls for opening with 85- to 90-ft-wide cuts along the strike of the seam near the outcrop, then working with successive cuts down the dip until overburden becomes too deep for economical stripping. The remaining coal is recovered by deep mining from slopes driven into the seam under the highwall. Spoil area for each cut is provided in the space opened by the preceding cut.

Daily production is about 1,500 tons, with stripping on a three-shift schedule and single-shift loading.

At the time the mine was visited, the overburden-to-coal relationships in the various pits were as follows:

The George seam in the valley is in two splits: 2½ ft of top coal and 7 ft of bottom coal separated by a 9-ft-thick divider. The southern tip of the seam lies within the property limits in the form of a long narrow finger under 95 ft of cover. The upper 30 ft requires no blasting but the lower 65 ft is hard sand rock. The entire seam, from crop to crop, is taken by a pair of draglines (4-yd Marion 4161 and 6-yd Page 621) after the overburden is blasted.

The 9-ft-thick Kidney seam lies under 50 ft of hard sandstone, and the 9-ft Twin seam under 75 ft of similar material. Two pits in the Ross seam are working 72 ft of cover for 6 ft of coal, and 90 ft of cover for 10 ft of coal. The 7-ft Bottom Red Ash seam is covered by 65 ft of overburden.

REMOVING OVERBURDEN

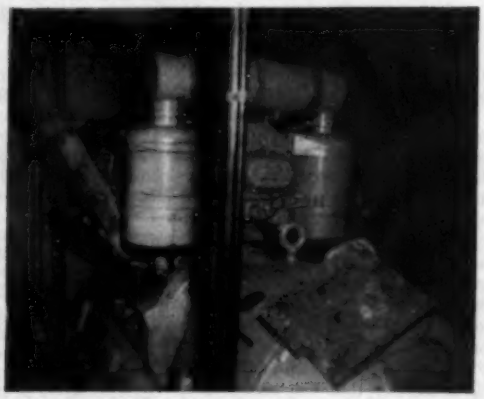
Overburden is removed in a conventional two-step cycle. First, the

How Newport Links Plans, Methods and Maintenance for Top Efficiency

SERVICE UNITS include bit-dressing shop (left) equipped with forge, chain-hoist and bit-dressing machine, and welding shop (right), where teeth for digging units are fitted with hard edges and abrasion-resisting lands on exposed surfaces.

VIEW OF EAST-ROSS PIT shows pitch of bottom rock, spoil room for next cut and stockpiled coal on highwall.

PARTS-SUPPLY ROOM features cataloged storage of parts and strict accounting system under full-time storekeeper.



SHOP-MADE BORING RIG (left) finishes seat for final-drive bearing on 4-yd electric shovel. Diesel-electric set (right), installed in a skid-mounted substation, powers electric shovel through short trailing cable, reducing dead weight of the shovel.

topsoil and softer material is taken off by dragline, shovel or bulldozer. Next, the hard rock overlying the coal is drilled and shot and the stripping units make a second pass to uncover the coal.

The cuts are 85 to 90 ft wide, as mentioned. However, on the initial cut a double-width swath of topsoil is removed to provide a working bench for the equipment and storage space for the coal that is hoisted out of the pits by the stripping units. On all following cuts, except the last, the topsoil cut is one step ahead of the hardrock cut.

Four draglines and an electric shovel are the major stripping units. The draglines are a 4-yd Marion 4161 electric-powered unit, a 4-yd Page 618, a 6-yd Page 621 and an 8-yd Page 625. All Page machines are diesel-powered. The shovel is a 4-yd Bucyrus-Erie 120-B, which also is electric-powered and operates from a portable diesel-electric substation equipped with a 475-hp Caterpillar diesel engine and a 3-phase 326-kva General Electric generator, 2,400/4,160 v. The skid-mounted substation is towed into position by a tractor and is moved from time to time as the shovel moves.

Hard overburden is drilled by four Bucyrus-Erie 42-T well drills, two of which are powered by a Caterpillar D-13000 portable diesel-electric substation. The others are diesel-powered.

The overburden drills sink 9-in holes on 18-ft centers, both ways, to a depth averaging about 60 ft. Holes are charged with Hercules explosive in 8½-in-diameter 50-lb cartridges fired with detonating cord. A normal shot consumes about 20,000 lb of explosive in 12 holes.

In planning the work at Newport, every effort is made to keep rehandling of spoil to a minimum. Therefore, four 15-ton Dart 140 trucks haul spoil to worked-out pits when it is calculated that such spoil might interfere with later operations. The spoil-haulage trucks usually team up with the 4-yd shovel, which is used where hard digging is to be expected and where spoil area is at a premium.

LOADING COAL

Because of the pitch of the seams, it is next to impossible to haul coal out of the pits. There re, the alternative—hoisting it o t by draglines—is the accepted method at Newport.

After the overburden has been removed and cast into the void remaining from the previous cut, the coal is drilled and shot, if necessary, and is raised by the draglines to a cleaned stockpiling site on top of the hard overburden.

Three maneuverable loading shovels—a 1¼-yd Bay City, a 1¼-yd Manitowoc Speedshovel and a ⅝-yd Insley—retrieve the coal from these stockpiles and load it to a fleet of 24 10-ton Brockway and Reo trucks. Employment of the loading shovels in this manner permits their use at any of the pits on short notice and keeps them from being blocked in the pits or from interfering with the smooth operation of the stripping machines. Furthermore, the construction and maintenance of access roads into the pits is kept to a minimum, the equipment is never exposed to foot-of-the-highwall hazards, and the trucks are not forced to labor out of the pits under load. At the time the mine was visited, however, coal in the West Ross opening was loaded in the pit because the lay of the seam was suitable and construction of an access road with reasonable grades was feasible.

STOCKPILING COAL

Newport's coal is hauled to nearby preparation plants and the demands of efficient operation require that coal be available when the plants need it. To meet these day-to-day demands, management plans and conducts the work so that a supply of coal sufficient to fill two months' orders is always available in the stockpiles.

Besides releasing enough coal to cushion fluctuations in demand, the policy of keeping stripping well ahead of loading permits the development of effective plans and, more important, adherence to those plans.

At present, stripping in the Bottom Red Ash vein has reached the planned limits, and a slope now is being developed to recover deeper coal by underground methods.

For leveling spoil, Newport has three Allis-Chalmers HD-19 bulldozers, one Allis-Chalmers HD-14, and a Caterpillar D-8. These units also haul the portable substations, clean stockpile sites, maintain roads and supplement the stripping units in removing soft overburden.

MAINTAINING EQUIPMENT

The service area at the entrance to the operation includes offices, shops, warehouses and garages, all constructed of wooden framing and covered with corrugated galvanized iron. Evidence of good housekeeping, as shown in the illustrations, is the most striking feature of the area. The road to and within the area is hard and well-graded. Occasional sprinkling controls dust that might otherwise be stirred up by the coal trucks as they pass through the area on trips to and from the preparation plant. There are no accumulations of scrap materials, empty cartons, lubricant containers or lunch wrappers. Newport, like many other modern mines, is a credit to the coal business.

Having developed the mine to the place where adequate coal is above ground to meet any demands that might be made, Newport's management is in a position to follow rigid schedules with regard to equipment maintenance. The draglines and shovel are brought to the service area in rotation, where they are stripped of worn parts, refitted with new or rebuilt parts, steam-cleaned, repainted and otherwise returned to first-class condition.

The machine shop features portable units, such as the boring rig in the illustration, which can be taken to the point of use, rather than removing heavy components from the large units and taking them to the shop.

The newest building in the service area is a heavy-equipment shop for bulldozer, truck and well-drill repairs. It is equipped with a monorail chain hoist to ease the job of disassembly and a pit for underside repairs. The welding shop is equipped to keep the cutting edges of stripping units in best condition and one welder spends most of his time in this work. The bit shop has a Bucyrus-Erie bit-dressing machine for conditioning the 9-in bits used by the well drills.

The parts-supply room, with a full-time storekeeper in charge, features a well-arranged line of the most frequently used parts, and here, also, good housekeeping is the byword.

FULL-CIRCLE PLANNING

Thus, Newport's policies with regard to planning, stockpiling and maintenance generate a cycle of effects that tend to compound efficiency. To start, intelligent planning and sound engineering permit a share of the company's efforts to show up in stockpiled coal. Next, the coal above ground permits additional long-range planning and unhurried, scheduled maintenance. Finally, scheduled maintenance completes the circle by insuring efficient performance of equipment so that plans may be fulfilled.

Trackless Mining and Belt Haulage Underly High Efficiency

"PRICE RIVER LUMP" at the source, with loading machine in dipping place discharging to 10-ton cable-reel shuttle car.

PREPARATION includes picking, screening and binning prior to trucking to the railroad. Main belt ends above tipple.

CUTTING FOR ALL UNITS is handled by this rubber-tired machine with 9-ft bar using throwaway bits.

NEW ALL-HYDRAULIC DRILL prepares shotholes for both loading units at Coalcreek.

BELT JUNCTION shows slope belt, expected to reach a length of 2,000 ft, discharging to the main belt.

CRAWLER TRUCK originally used to move shortwall equipment now serves as supply carrier.

MAIN-BELT LENGTH is 1,500 ft on an average grade of 3% up to the portal. The drive is a 40-hp motor.

High-Tonnage Mining

If You've Wondered Whether Mechanical Mining Can Pay Out at a "Small" Operation, Coalcreek Proves It With Ultra-High Production per Man

Coalcreek Plan: Belt Haulage, Crawler Loaders and Rubber-Tired Auxiliary Equipment

Coalcreek Results: Average Output of 800 Tons per day with 14 Men in Thick Coal Dipping 10%

TRACKLESS MINING and belt haulage, with some assistance from certain favorable natural conditions, are resulting in ultra-high efficiencies at the No. 2 mine of The Coalcreek Coal Co., Inc., in the mouth of Coal Creek Canyon some 14 mi north of Wellington, Utah. With an average of 14 men underground and on the surface, production of hand-picked shaker-screened coal loaded into bins ready for trucking to the railroad was averaging 800 tons per day at the time the material was gathered for this description. Daily performances of 60 to 75 tons per man are frequent and, on occasion, tons-per-man averages of 100 have been approached or exceeded.

The Coalcreek operation is the result of efforts extending back to 1941 and '42, when B. G. Powell, founder of the company and now sales manager, built a road to the site of the mine and began operations on a small scale with mine cars and hand loading. Company headquarters are in Salt Lake City, with Mr. Powell's wife, Melba S. Powell, as president. Operations at the mine are directed by Elden van Wagoner, with Harold Corney as master mechanic. Levar Stanfield, of Wellington, is trucking supervisor.

Production is derived from the Aberdeen seam, varying from 7 to 11 ft in thickness, with an excellent sandstone top and a sandstone bottom. The seam carries a band of slate varying from 0 up to 1½ to 2 in in thickness 5 ft up from the bottom. Otherwise, it is clean.

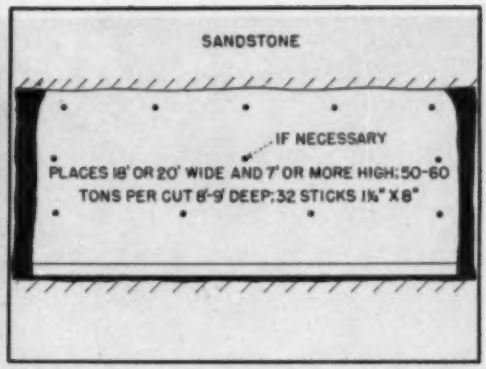
The product of the company is sold under the trade name "Price River Lump," and is a high-rank, hard, free-burning coal with little soot. Moisture and ash both are low —3 to 4%. Sizes normally produced are 10- or 12-in lump, 3x10 or 3x12 small lump, 1x8 egg, 3x1⅝ nut and 1⅝x0 screenings. The individual sizes, after picking and screening, are discharged into storage pockets, from which they are loaded separately into Diamond T trucks with 10-ton bodies for the 14-mi haul to the rail-loading ramps on the Denver, Rio Grande & Western R.R. at Wellington. Ten truck drivers are employed to bring the coal from the tipple to the railroad.

No coal is sold locally. Major markets are in the Pacific Northwest — particularly Washington, Oregon and Idaho.

MINE BUILT AROUND BELTS

The Aberdeen seam outcrops on the mountainside at the site of Coalcreek No. 2 and dips approxi-

CABLE-REEL SHUTTLE CAR discharging 10-ton load of coal to the 1,500-ft-long main belt.



DRILLING PATTERN for 18- or 20-ft place making 50 to 60 tons involves 12 holes. Coal is undercut prior to shooting.

mately 10% due north. The goal in development is to work down the dip with rooms on the strike. This, among other things, helps in the removal of gas. Consequently, the main opening is a beltway driven northwest slightly off the pitch, or with an average grade up to the drift mouth of approximately 3%.

Present length of the main belt is 1,500 ft, with approximately 500 ft from the end to the boundary of the present acreage. The conveyor is a Joy unit with 36-in belt equipped with a 40-hp motor. The belt is reversed to take supplies into the mine. From the tail end, they are distributed to the working places by a Joy truck converted from a shortwall carrier to supply service.

For mining down the dip from the main belt, a Robins conveyor, also 36-in, is employed. It is presently equipped with a 25-hp motor, but since the length is expected to reach a maximum of 2,000 ft, it is designed for installation of a 50-hp driving unit.

The 36-in belt width was selected to match the high discharge rates of the 10-ton shuttle cars employed. The schedule for a single car is 3 min, which means that the theoretical interval between shuttle-car loads is 3½ min. With, at the present time, one car discharging to the end of the main belt, and the other to the slope belt, the operator of the main-belt car, if coal is coming off the slope belt, waits until the run is completed to prevent overloading. When both cars discharge to the slope belt, this need for occasional waiting naturally will be eliminated.

Slopes down from the main beltway are sunk at intervals corresponding to normal room length, using the belt and one or two shuttle cars. The plan is to go down to the limit and then mine rooms and recover pillars by slabbing on the retreat.

B. G. POWELL, Coalcreek founder and sales manager.

TWO UNITS HANDLE LOADING

Loading equipment at Coalcreek No. 2 is divided into two units, both of which, however, are served by the same cutting and drilling units. On this basis the equipment list is as follows:

Two 11 BU loading machines.

Two 10-ton 60-E elevating-discharge shuttle cars, or one for each loading machine. These shuttle cars discharge onto the ends of the belts.

One 10 RU rubber-tired universal cutting machine with 9-ft bar using Bowdil bits.

One CD-25 all-hydraulic single-arm coal drill using Coalmaster augers and Kennametal bits.

In addition, 7-B shortwall equipment previously employed is available for spare service, along with drilling equipment of the post type. The shortwall truck equipment, as previously noted, is used in supply service. M-S-A Bantam equipment is installed for rock-dusting, and water is piped to all places for dust control.

Headings for the main beltway and for the slopes are driven 18 ft wide. Room width is 20 ft. The coal is prepared for shooting by undercutting and drilling with 11 or 12 holes, as indicated in the accompanying drawing. A room-width place makes 50 to 60 tons, which is broken with approximately 32 sticks of 1¼x8 Black Diamond No. 7, shot off-shift.

Both loading machines are operated on the first shift for the major portion of the tonnage. One or the other is the run on the second shift. Also at the same time cutting, drilling and loading of shotholes is done. On this basis, the normal underground crew is as follows: three Joy operators, three shuttle-car operators, two machinemen, one driller, one shotfirer and shift foreman (second shift), utility man, and master mechanic, or a total of 12. Two men are employed regularly on the tipple on the day shift. On the second shift, operation is taken care of by the truck drivers, with assistance as necessary from members of the second-shift crew.

With the recent construction of a 44,000-v high line to the mine location, the original engine-powered generating equipment has been dispensed with, and electricity now is derived from a main transformer station comprising three 333-kva units. Two 150-kw mg sets convert AC to 250-v DC which is taken underground by rubber-covered and armored feeders. Air is supplied at a rate of 60,000 cfm by a 6-ft disk fan. Returns from the slopes are overcasted across the belt heading.

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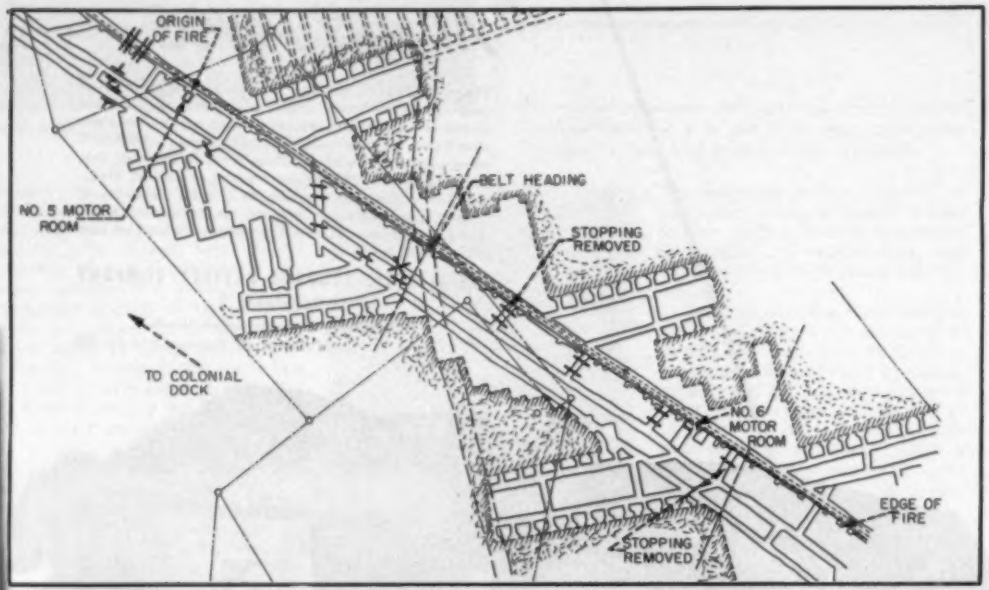

FIGHTING THE FIRE, which started in this section of the mine, demanded quick response, iron-clad organization, sharp rescue teams and sweat. A fumbled job would have resulted in untold property damage and the loss of work for many employees.

The Colonial Mine Fire—Part 2

How the Colonial Fire Finally Was Extinguished by the Intelligent Application of Time-Tested Methods

By WAYNE D. SNELL, Assistant Director of Mine Inspection
Coal Division, United States Steel Co., Pittsburgh, Pa.

FOLLOWING THE DECISION to continue fire-fighting operations from the river end of the belt heading, state, federal and company officials agreed upon a course of action and issued directives as follows:

1. "Complete the construction of stoppings at the Colonial end of the belt line and leave doors in stoppings open." This refers to stoppings in the belt heading and two parallel entries just outby No. 7 motor room.

2. "Build incombustible stoppings on river end of belt line, equipped with doors to permit passage of cars." These stoppings were to be built to form an airlock in the belt heading just inby the first crosscut inby No. 4 motor room. Single stoppings were to be built opposite the airlock in the two parallel headings.

3. "Close doors at Colonial end 30 min before doors are closed at river end."

4. "As doors are closed at river end, open stoppings between air course and heading." This refers to the stopping in the first crosscut inby No. 4 motor room, which previously was knocked out.

5. "As soon as the rescue men get outside at the river end, start the fan at the river end."

6. "Thirty min after the fan has been started at the river side, the rescue men will enter from that side."

7. "Build airlocks on belt heading and one door in a stopping on one of the air courses." The inby door of the second airlock was built about 100 ft outby No. 5 motor room, and single

Abstracted from a paper presented to the Coal Mining Section, Western Pennsylvania Safety Council, Pittsburgh, Pa., April 25, 1951.

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stoppings in which doors were installed were constructed in each of the two parallel headings at points opposite the airlock.

SEALING THE FIRE

At 12:05 pm, Sunday, Nov. 5, the drop-door in the seal on the intake side of the belt heading on the Colonial No. 3 side of the fire was closed and sealed; at 12:40 pm the second drop-door was closed and sealed. The rescue team withdrew from the mine.

Then the doors in the seals at the docks were closed, and the temporary seal in the second parallel was removed to establish a return to the newly-installed fan. At 1:20 pm the fan was started and supplied 22,750 cfm, measured at the intake. The air circuit was through the belt heading to the open crosscut outby the seals which were 130 ft inby No. 4 motor room. A second stopping with a door was built outby the seal, forming an airlock. Following the resumption of activities at Colonial docks, a safety inspector and mine-rescue crew made regular inspections of the seals at No. 7 motor room, took samples of mine atmosphere inside the seals and reported the general security of that locality.

Advancing through the belt heading to a place 550 ft inby the airlock, rescue men found an accessible stopping in the first angle chute outby No. 5 motor room and removed it. The chute then was sealed by triple canvas until ventilation could be established to this point. Next, a temporary stopping was built across the belt heading inby the angle chute. The rescue men then entered the second right parallel and advanced to a place inby the junction of the angle chute and the first right parallel. There they built wood-fiber-plastered regulator stoppings in the first and second parallels.

Air was directed through the angle chute, clearing the territory inby the lock doors to the newly-erected stoppings. Airlock doors then were built 110 ft outby No. 5 motor room to lock the intake side of the line brattice which was to be carried with the advance into the belt-heading fire area. In other words, the heading was divided into two equal parts offering essentially equal areas on intake and return, and facilitating material-handling and the necessary temporary construction. The line-brattice return was established to the angle chute.

A second 4-in water line, complementing the original at Colonial docks, was laid to take advantage of the river-boat pumps.

ADVANCING AGAINST THE FIRE

The work of extinguishing the fire was carried to a place 600 ft inby the airlock doors to the third crosscut inby No. 5 motor rooms. Much fire and heat was encountered and, since the territory had been subject to roof falls for almost the entire distance, the results so briefly described here were achieved only after considerable difficulty. With the fire extinguished to this point, ventilation was established to this angle chute by removing the stopping therein from the parallel side.

The open crosscut inby No. 6 motor room caused great concern because it was a prime factor in the isolation of the fire. To reach it, the larger volume of air was transferred from the belt heading to the first right parallel, using the angle chute outby No. 5 motor room as an intake. The rescue team made the necessary exploration of the parallel and advanced to the open crosscut.

Considering the difficulties in the parallel and the necessity for maintaining and consolidating the gains made in the belt entry, it was decided to construct an overcast in the first parallel heading at the recently-established crosscut 500 ft inby No. 5 motor room, thus establishing two separate splits in the affected territory.

The advantages of this course of action are (1) it permitted operations to continue in both the belt heading and parallels, (2) it permitted installation of water lines and transportation of materials to affected areas in the first parallel, (3) since it was necessary to fight the fire in the crosscut inby No. 6 motor room, the overcast provided separate splits which permitted fighting the fire from both ends and (4) it provided a fresh-air split for patrolmen to make inspections of areas where seals were to be erected and permitted sampling the atmosphere behind the seals.

About this time it was determined that the Alice fan was pulling too much air over the fire area, so it was shut down immediately. The Colonial No. 3 fan supplied adequate air in the headings at that end of the mine.

OPERATIONS IN PARALLEL ENTRY

At this point it will be worthwhile to detail the operations in the parallel, because they were vital in isolating and extinguishing the fire.

When fire broke out in the crosscut outby No. 6 motor room all effort was concentrated on controlling that outbreak. A 2-in water line was laid from the outside to No. 5 motor room and then into the parallel to augment the water supply which was being reduced by the fire hoses. Heretofore, one 300-gpm pump on the surface was taking water from the river, and now another similar pump was added. Fog nozzles were used in the parallel to fight the fire, so ample pressure was needed.

Then fire broke through in the second crosscut inby the overcast, and though it was controlled immediately it imposed an additional load on the pipelines. To correct this and to prepare for advancing through the crosscut inby No. 6 motor room a third 4-in line was laid from the surface into the parallel through No. 5 motor room. After putting out the fire in the crosscut inby No. 6 motor room and advancing through it, and extinguishing all flames in the vicinity of the belt heading, the limits of ventilation were reached and it was decided to withdraw and build a seal in this crosscut. Then all four stoppings from this crosscut to the overcast were reinforced or doubled by masonry work to prevent any failures. Each stopping also was equipped with one or more sprays, which proved to be very effective. Also, each stopping was pierced by a 1-in gate valve to permit sampling of atmosphere inby the seal and fitted with a thermometer to register marked changes in temperature. Thus, ample protection for the parallels and vital information from the sealed fire area were provided.

During activities in the parallels water continued to rise beyond anticipated limits with prospects of flooding the remaining territory, a fact that was considered highly improbable until that time. However, this opened another avenue of attack, and it was exploited by pumping water behind the seals from the Alice sumps and permitting water from the Colonial No. 3 reservoir to feed by gravity into the fire area. Most water came from the river, however, with 600,000 gpd being pumped through the fire-hose outlets.

Upon completion of work in the parallel the main volume of air was returned to the belt heading and a line brattice was carried from the overcasted crosscut 220 ft toward the next crosscut.

SETTING CRIBS AND TIMBERS

Cribs with treated-plank lagging were the most common form of timbering in fall areas because they are conveniently handled, rapidly built and offer stable and reliable support. Generally the roof separated at a bedding plane from 14 to 20 ft above the floor, presenting an almost rectangular cross-section in the belt heading. Here, square-set timbers with plank lagging and bracing were used.

Advance from the overcasted crosscut was rapid, with most activities confined to fighting local fires and reducing the temperature of the fallen slate. This was done with large volumes of water from fog nozzles and standard fire-hose nozzles. During this advance ventilation was seriously disrupted by leakage of air through the fallen slate to the return side of the line brattice. To correct this, a small blower fan, capable of delivering 4,000 cfm through 200 ft of 24-in canvas tubing, was installed in the intake

Coming Next Month

THE IRREDUCIBLE MINIMUM, or number of mine accidents per yr that can be considered as satisfactory safety performance, is dissected and examined. What is the Irreducible Minimum? To achieve it, what attitudes are required among mineworkers and officials? These are questions slated for discussion in Foremen's Forum for November.

outby the line brattice. This was effective for short distances, but the final solution was enlarging the return side of the line brattice by removing the slate and improving the efficiency of the airway by sealing its perimeter with canvas flooring, wood-fiber plaster and rock dust.

The reconstructed line brattice and blower fan permitted advance to the fourth crosscut beyond No. 5 motor room. Prior to reaching this crosscut a line brattice was erected in the parallel to conduct air from this crosscut through the parallel to the return at the overcast.

After advancing that far in the belt heading the crosscut was opened and the line brattice sealed to establish ventilation to that point. A short distance inby the newly-established crosscut, the roof was found to be in good condition in the belt heading and rapid advance to the next crosscut was made. The fire-damaged roof was supported on cribs. A high, arched fall was encountered 125 ft inby the open crosscut, and water had risen to within 19 in of the beams at the lip of the fall. Because of the hazardous approach the roof was taken down from the last open crosscut to the fall.

When this was done and the rescue men had advanced to the fifth crosscut inby No. 5 motor room, it was discovered that water had risen to the roof. Further advance was impossible, but the presence of water at such height eliminated the possibility of fire beyond this point, except in pockets in falls above the water line or in gob areas to the left of the belt entry. However, the area was dewatered and no fire was found.

FIRE IS CONQUERED

On Dec. 24, 1950, 55 days after it had started, it was finally determined that the fire was extinguished. Rehabilitation progressed as fire-fighting continued, so normal operations were resumed on Jan. 2, 1951, 10 days after the fire was out. About 13,000 tons of slate were loaded out during rehabilitation.

Fighting the fire and restoring the belt to its original condition were accomplished without a single lost-time accident. You may be interested to know that since its construction in 1924 the Colonial belt system has carried over 80,000,000 tons of coal without a fatality.

Although exhaustive investigations have been made by federal, state and company officials, the cause of the fire has not been conclusively fixed. There are several possibilities, of course, most of which speculate on an electrical failure, but there is no proof that such a failure occurred.

CAN YOU USE MORE DOPE on cutter chains and bits, vibrating screens, shuttle cars or belt-conveyor idlers? Manufacturers' data on these and some 40 other items are yours for the asking. Be sure to check over pp 120-125.

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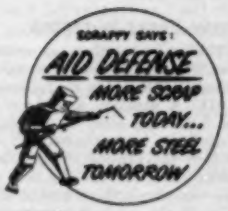

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UNITED STATES STEEL

How Trailing Cables Are Tested for Flame-Resistance

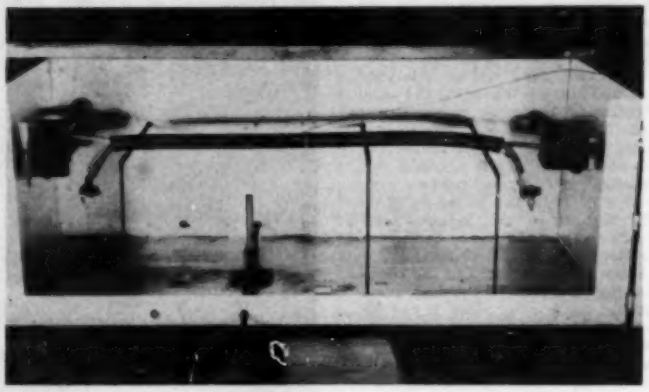
By T. R. WEICHEL,
Mining-Electrical Engineer, Hazard Insulated Wire Works, Div. of The Okonite Co., Wilkes-Barre, Pa.

A REVISED PROCEDURE for testing the flame-resistant characteristics of 600-v trailing cable, recently announced by the Pennsylvania Department of Mines and the U. S. Bureau of Mines, sets up more rigid requirements which will set a new standard of safety in coal mines.

The original requirements for trailing-cable flame tests were established May 14, 1945, by the Pennsylvania Department of Mines. Similar requirements were included in the Federal Mine Safety Code, which was adopted in 1946, and in the Oct. 21, 1947, amendment to Bureau of Mines' Schedule 2E.

After about 4 yr of successful operation under the original procedures, the two agencies decided to review the tests and revise them if necessary.

At a meeting of cable manufacturers in August, 1949, Richard Maize, Pennsylvania Secretary of Mines, appointed a special committee for the work. After 12 mo work on the project, the committee presented a new test procedure, which was adopted by both agencies.



TEST SET-UP shows how samples of trailing cable are mounted in chamber for electric heating and trial-by-fire. Wrap at the center of the sample is a thermocouple for determining cable temperature. (Photo, U.S. Bureau of Mines)

HOW CABLE IS TESTED

The test procedure as contained in the December, 1950, amendment to Schedule 2E reads as follows:

"(1) A straight sample of the cable 3 ft long shall be mounted horizontally in a ventilated test chamber so that the sample will not be in the direct path of entering air currents. The sample shall be heated electrically until the conductor temperature is 400 F, using a current that is 500% of the following conductor ratings. . . [see table]:

"(2) When the conductor temperature has reached 400 F, the flame of a Tirrell gas burner, adjusted to give an overall free flame-height of 5 in and a 3-in inner cone, shall be applied directly underneath the sample at a point 14 in from its extreme left-hand end so that the tip of the inner cone touches the bottom surface of the sample.

"(3) At the end of 1 min the heating current and gas flame will be cut off simultaneously. The sample will be considered as having failed to pass the test if the length of the burned area exceeds 6 in or if burning continues longer than 5 min after the gas flame has been cut off. [The former propagation limit was 14 in.]

"(4) For a complete official test, at least three samples of a given cable will be subjected to the foregoing test. If two out of the three samples pass this test, the cable will be accepted for listing as "flame resistant" and shall be suitably marked at intervals not exceeding 12 ft with an identifying number assigned by the Bureau.

TEST APPARATUS

The test apparatus essentially is the same as that used in the original tests, with the possible exception of a higher-capacity transformer to permit testing of larger cables. In addition to the ventilating hood, the unit consists of a transformer, rheostat for adjusting test current, circuit breaker, timer for checking duration of test, ammeter for reading test current and a potentiometer for obtaining temperature readings.

USBM REQUIREMENTS

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How to Test Trailing Cables . . . Cont'd

Normal Current Ratings for Trailing Cables

Conductor Size	Single Conductor	Amperes per Conductor — Two Conductor — Flat	Concentric	Round	3-Cdr	4-Cdr	5-Crd	6-Cdr
8	45	40	..	40	35	30	25	20
6	60	50	50	50	50	40	35	30
4	85	70	65	70	65	55	45	35
3	95	80	75	80	75	65	55	45
2	110	95	90	95	90	75	65	55
1	130	110	100	110	100	85	75	65
1/0	150	130	120	130	120	100	90	80
2/0	175	150	135	150	135	115	105	95
3/0	205	175	160	175	155	130	120	110
4/0	235	200	180	200	180	150	140	130
250 MCM	275	..	..	220	200	160	..	..
300 MCM	305	..	..	240	220	175	..	..
350 MCM	345	..	..	260	235	190	..	..
400 MCM	375	..	..	280	250	200	..	..
450 MCM	400	..	..	300	270	215	..	..
500 MCM	425	..	..	320	290	230	..	..

Cords, AWG Size	1–3 Conductors	4–6 Conductors	7–9 Conductors
14	15	12	8
12	20	16	11
10	25	20	14

"All new trailing cables used on electric mining equipment shall be constructed of materials having fire-resistant qualities." In addition, the October, 1947, amendment to Schedule 2E states that as a permissibility requirement trailing cables "shall have an outer sheath of rubber or equivalent material that is highly resistant to abrasion, moisture and flame. The cable shall meet the flame resistant tests . . . in Section 18.6 (c)."

Therefore, cables passing the prescribed tests carry the P and BM markings of the Pennsylvania Department of Mines and the Bureau of Mines together with the manufacturer's code number. The markings are embossed in the sheath at intervals not exceeding 12 ft.

Considerable progress has been made in the development of flame-resistant cables within the last 4 yr. This is principally the result of research and the development of suitable neoprene compounds and of the experience gained through the use of flame-resistant cable on mining equipment. Requirements for flame-resistant cables by government agencies and consumers also are responsible for the advancement. Increased mine safety and the saving of many lives are a result. One need only compare the number of ignitions of methane, coal dust and coal during the time the more-flammable rubber-sheathed cables were permitted in coal mines to realize the advantages obtained from the use of flame-tested cables.

TRACK WHEEL, gearing and dog and bar mechanism which automatically open the bucket doors are on the right side of the carriage (left photo). Close-up (right) shows the dog (A), sliding bar (B) and bar (C) to which the trip rope is attached.

Buckets Discharge Automatically When Tram Is Reversed

SEVERAL YEARS OF CONTINUOUS USE have proved the value of automatic trippers installed on the two buckets of an aerial tram handling refuse from the tipple and washing plant of the Pruden Coal & Coke Co., Pruden, Tenn. The device, developed by D. E. Griffith, president of the coal company, and built by J. R. Hoe & Sons, Middlesboro, Ky., opens the bucket doors when the direction of travel is changed from forward to reverse.

As shown in the photos above, the unit is gear-driven from the rear load-carrying wheel. Dog A furnishes the power to pull the small wire rope that trips the door latches. It is held out to full radius by a spring and makes one revolution for each 12 ft of bucket travel.

On the outgoing trip, the rotating dog slips over the inclined side of a notch on the sliding bar, B, which lies alongside another bar, C, to which the trip rope is attached. Reversing rotation of the dog (occurring when the bucket starts back) causes it to catch on the straight side of the notch, thus moving Bar B which engages Trip Bar C through lugs.

The free end of Bar C rides up a sloping plane near the end of the tripping stroke so that it is raised about ⅛ in as the doors are opened, thus disengaging itself from Bar B and permitting the doors to close after the load is dumped.

Originally closing by gravity, the doors latched immediately after dumping. With wet refuse, however, it was found desirable to keep the doors open a few inches so that dribbles could fall out as they continued to be loosened from the sides and bottom of the bucket. For this purpose, ratchet catches, released by the tram operator before he operates the chute gate to load the bucket, were installed on the sides of the bucket and have solved the problem.

"Repeated Use"
Reduces Bonding Costs

Bonds that do their job over and over again are saving money with each new installation, and in these days, they are helping tremendously to make the operator's stock of bonds go further. Easy reclaimability of every O-B Wedge Bond is enabling many operators to cash in now on the "Repeated Use" feature of this bond.

The material car shown here carries wedge bonds that have been taken up from old track. Since they are ready for re-use without attention, they can be sent directly to new sections for application in new track.

When it is important to have mining materials do extra duty, O-B Wedge Bonds are especially valuable. Why not consider their "Repeated Use" feature for your haulage system?

HAULAGE WAYS *Jr.*

The end of this tool is formed to bear only on the end of the wedge. Thus the bond terminal is protected when wedge bonds are removed.

These O-B Wedge Bonds have been taken up for re-use in another track. Because the terminals of wedge bonds are unimpaired when they are removed from the track, the bonds can be put in place immediately without need for cleaning up or repair.

O-B Wedge Bonds are mechanically applied to the rail by means of a hardened steel wedge which tightens the bond terminal in a hole in the rail web. A few hammer blows on the end of the wedge produces a permanently tight mechanical and electrical connection.

Ohio Brass

MANSFIELD OHIO, U. S. A.

CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

HAULAGE WAYS *Jr.*

How to End Dead-End Problems

For Heavy Cables—A Heavy Strain—Holding Assembly

Five styles of O-B Wood Strain Insulators provide a number of end fittings for various attachment methods.

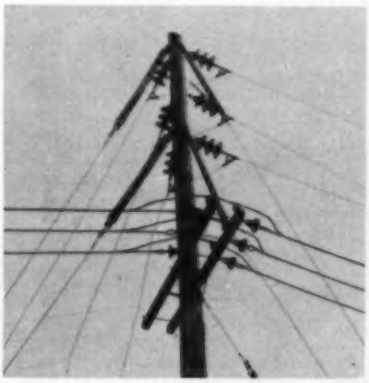
Here's a really rugged strain insulator assembly. Holding heavy feeder cables at dead-ends and strain-holding points with a minimum of sag requires high tensile strength in the cable-holding assembly. This installation gets it with O-B Wood Strain Insulators. In addition to the strength required here, the insulators provide good electrical protection. The long wood body, impregnated with an insulating compound, creates a long leakage path and provides adequate protection against sparkover between the conductor and the support. O-B Mechanical Feeder Wire Strain Clamps and O-B Insulated Turnbuckles complete the strain assembly.

It is interesting to note that the wood insulators are equally effective both in compression and under tension.

O-B HARDWARE AND INSULATORS FOR OUTSIDE DEAD-ENDS, TOO

There are plenty of places on the outside that require a sturdy dead-end or strain-holder. See how the job was done on an outside power distribution system. O-B Suspension Insulators and O-B Strain Clamps did a neat job of handling a number of conductors in a rather congested area.

O-B Suspension Insulators and Strain Clamps are shown in the O-B Insulator Catalog No. 26. If you don't have one in your files, ask your O-B representative for further information regarding them.



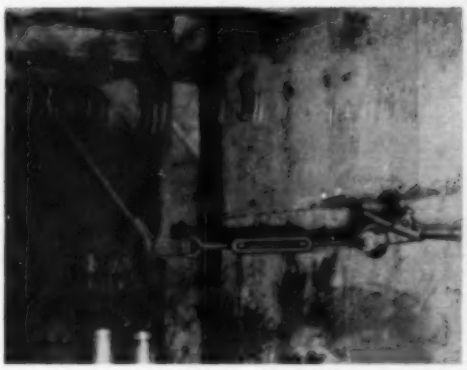
● Dead-ending and strain-holding assemblies needn't be problems when you have the proper fittings on hand, designed to do the job. Take a look at the arrangements shown on these pages – see how well standard O-B fittings have been used in a number of different cases.

Other O-B fittings for this sort of work are shown in your O-B Mining Catalog; from them you can select a group of clamps, insulators and turnbuckles to handle any of your situations. No more need to improvise when they're in your stock room, ready for use.

Relieve Strain at Switch Connections

Another popular strain-holding method uses O-B Porcelain Insulators for electrical protection. Shown here in use with O-B Feeder Strain Clamps and O-B Insulated Turnbuckles, the entire assembly is used to bring a slack cable end up to a feeder switch.

A closer view of a similar set-up shows the three parts more clearly. Porcelain insulators offered by Ohio Brass Company for this purpose have tensile strengths ranging from 10,000 to 20,000 pounds with dry flashover ratings from 25 to 35 kilovolts. Corresponding wet flashover values range from 14 to 18 kilovolts.



At the End of the Line . . .

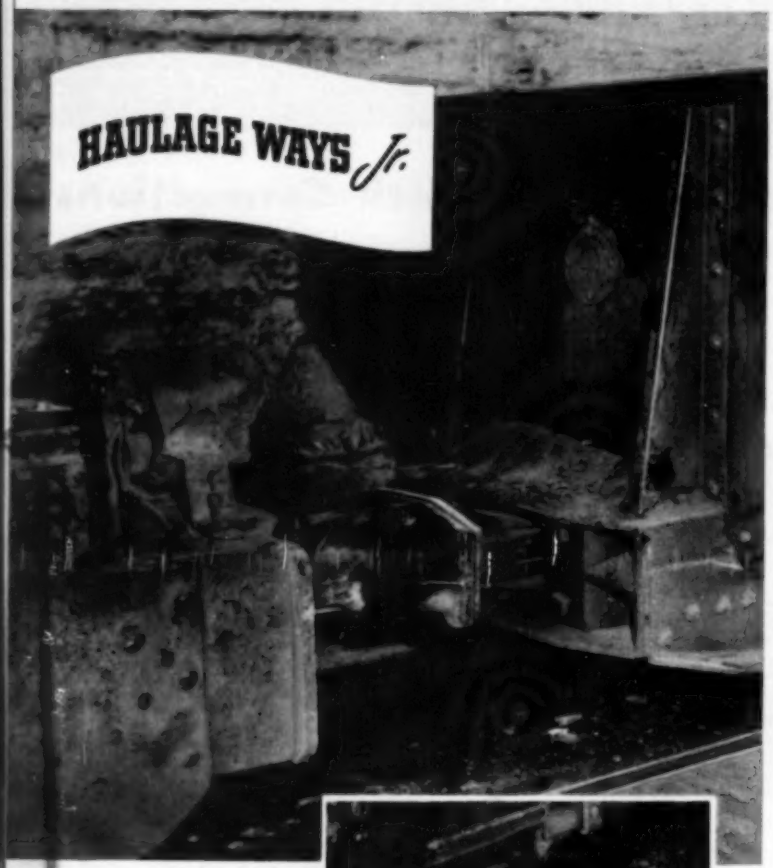
At the end of every trolley overhead some provision must be made to hold the wire taut and tightly anchored. Here the job was done simply and effectively with an O-B Dead-End Cam Grip and an O-B Insulated Turnbuckle. A set screw in the grip acts on a cam with teeth that lock the trolley wire, holding it securely. The trolley wire is not kinked, and extensions are easily added to the free wire end.

See your O-B Mining Catalog No. 27, pages 49 through 54 for other dead-ending and strain-holding devices. They'll put an end to your dead-ending problems!

Ohio Brass

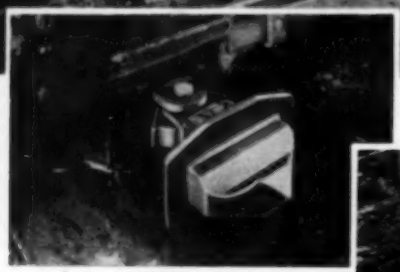
MANSFIELD OHIO, U. S. A.

Swift, sure coupling without using hands!



The practice of coupling moving cars, recently cited as one of the major unsafe practices contributing to haulage facilities, has been eliminated on many properties by replacing out-moded link-and-pin hitchings with O-B Automatic Mine Car Couplers. Cars equipped with these couplers join swiftly – securely – on impact, without need of guidance by a workman. Uncoupling cars is accomplished by raising a lever located on the side of the mine car. With the need for entering the between-cars danger zone no longer present, an unsafe practice no longer exists wherever cars have been equipped with O-B Automatic Mine Car Couplers.

Swift, sure coupling – and uncoupling – without the use of hands is a safety feature worthy of your consideration. Be sure to include O-B couplers in your plans for the remodeling of old cars or when new cars are needed.



Gathering locomotive couples with mine cars automatically. No guidance is needed to bring mating heads together, and they couple securely without attention. Motorman uncouples car without leaving his seat!

Mating heads of the O-B Automatic Mine Car Couplers are designed to guide one another as they come in contact. Pyramid shapes cause the heads to seat themselves, rather than to jackknife, or sway to opposite sides of the car centerline.

Ohio Brass

MANSFIELD OHIO, U. S. A.

CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

4094-M

LITTLE THINGS HAVE A WAY OF ADDING UP!

Extra production for defense calls for extra vigilance against machinery breakdowns. Often, these breakdowns are caused by little things—a scored bearing, a clogged oil line, perhaps a worn gear—but these *little* things really add up! For example . . .

A metal-working plant was replacing 50 special bearings per week—at a cost of $6.00 each! Machine downtime kept rising—output kept falling.

A Socony-Vacuum Lubrication Engineer was called in, found the trouble (an inferior lubricant plus excessive dust), and recommended changes. Result? Bearing failures dropped to an average of one per week, production shot up, $15,000 was saved annually!

In *your* plant, too, Correct Lubrication may be the answer to increased production, lower maintenance costs. *Why not find out?*

Socony-Vacuum, with 85 years of lubrication experience, will develop a program of Correct Lubrication for *your* plant. Why not get this program started today?

SOCONY-VACUUM

GARGOYLE Lubricants

SOCONY-VACUUM

Correct Lubrication

WORLD'S GREATEST LUBRICATION KNOWLEDGE AND ENGINEERING SERVICE

SOCONY-VACUUM OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORP.

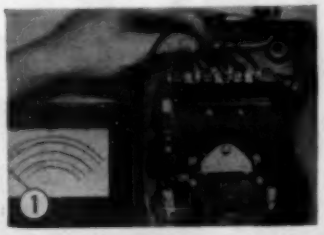
How to Check Four Common Symptoms of Motor Trouble

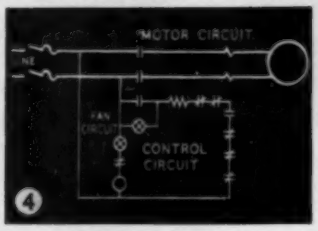
By BENJAMIN HANTMAN, Motor & Control Div.,
Westinghouse Electric Corp., Buffalo, N. Y.

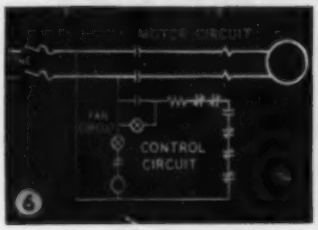
CONDITION: Motor Does Not Turn Over, and Is Quiet

CAUSES: Motor Not Getting Voltage; Main Line Open; Control Circuit Open

1. First check voltage at line terminals with voltmeter or test lamp.
2. If there is no voltage at starter, check main switch and line fuses.
3. If power is available, check contactor to see if it is mechanically free to operate.
4. If contactor operates freely, check control circuit for possible open circuit, as follows . . .
5. No voltage across the contactor coil means that it probably is all right and the control circuit is open elsewhere. Double-check coil by measuring its resistance but BE SURE POWER IS OFF.
6. Check control contacts, motor overload relay or motor protector.
7. Since most contacts are enclosed, check with a voltmeter. A voltage across any contact indicates that it is open.
8. Check for frayed wires and poor terminal connections. Vibration often is the cause of loose connections.



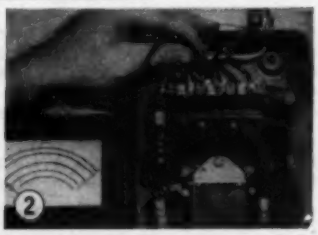




CONDITION: Motor Does Not Turn Over, but Growls or Is Noisy

CAUSES: Mechanical Jammings; Undervoltage; Faulty Motor

1. First try to turn motor shaft. If it does not turn freely, the load is jammed or the bearings are seized.
2. If the shaft turns freely, check line voltage with motor on the line. If the voltage is more than 10% below nameplate rating, motor can't start under load. If voltage is within rating and it's a 3-phase motor, check all three phases. One line may be open.
3. If it's a repulsion or DC motor, check brushes for contact with commutator. Check for dirty commutator.
4. If a capacitor motor, check centrifugal switch or relay for operation —it may be stuck open, leaving the starting winding disconnected. Check capacitors by measuring with a resistance meter.



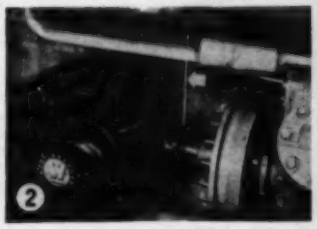
CONDITION: Motor Does Turn but Will Not Get up to Speed

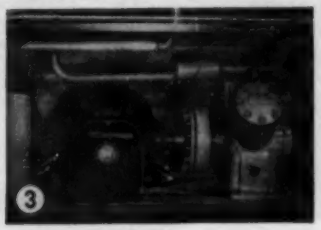
CAUSES: Undervoltage; Overloaded Motor; Poor Commutation

1. First check line voltage under motor-starting conditions. It should not dip to more than 10% below motor rating.

2. If voltage is satisfactory, motor may be overloaded. See that motor size is correct.

3. If it's a repulsion or DC motor, check for worn brushes or a dirty commutator. If a capacitor motor, perhaps the centrifugal switch isn't opening, leaving the starting winding on. This will result in an eventual capacitor burn-out.





CONDITION: Motor Gets up to Speed, but Runs Too Hot

CAUSES: Under- or Overvoltage; Poor Ventilation; Overload; Faulty Coupling; Centrifugal Switch or Starting Relay

1. Don't guess—measure the motor winding temperature with a thermometer. A piece of clay or even chewing gum stuck on the bulb end before it is inserted into the stator winding will help get an accurate reading. It should not exceed 90 C (194 F). Winding temperature is affected by ambient or enclosure temperature.

2. Ambient temperature should not exceed 40 C (104 F). Most drip-proof motors are rated at 40 C temperature rise (by thermometer) over a 40 C ambient and include a 10 C safety factor.

3. Check ventilation of motor enclosure to see that openings are not clogged with dirt or lint. Look for other obstructions.

4. Check motor itself to make sure it is not fouled with dirt. A motor needs plenty of breathing spaces if it is to run cool.

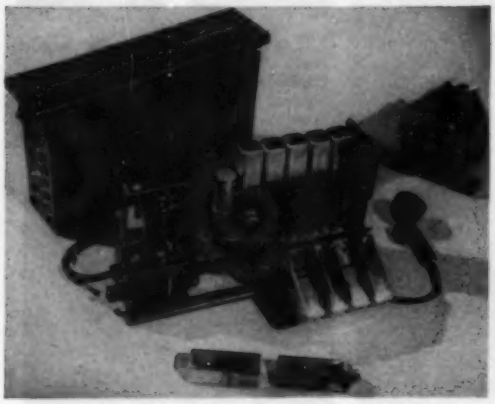
5. Check the line voltage to see that it is within 10% of rated value. Either over- or undervoltage will cause motor heating. If it's a 3-phase motor, check all three phases.

6. Check the motor current against the nameplate current to see if the motor is overloaded.

7. Check the line-up of the motor and its load. Maybe one or the other has shifted on its foundation. Misalignment causes added motor load, as well as rapid wear of couplings or belts.

8. Check proper operation of centrifugal switch or starting relay of single-phase AC motors and the starting mechanism of repulsion and DC motors. Make sure the motor isn't cycling (repeated frequent starts) because of faulty control-circuit operation.

COAL AGE is always glad to publish good "Operating Ideas" so why not tell us about yours. We'll pay $5 or more for each published. Just write The Editor.



New, Lighter, More Compact Mine Phone Features "Plug-in" Maintenance (1)

A new-type Femco Trolleyphone, lighter and more compact than previous models, utilizes a new "packaged maintenance" design with plug-in components in the FM carrier circuit which can be quickly changed by anyone. The simplified maintenance permits immediate resumption of contact without slowing or halting mine production while awaiting arrival of a mine electrician, the maker points out. Designed to carry 2-way talk over existing mine AC or DC circuits between stationary and/or moving stations, the entire set now weighs only 50 lb and consists of a shock-mounted transreceiver in a heavy case, loudspeaker and press-to-talk microphone. Some 30 lb. lighter than formerly and 50% more compact with elimination of the resistor box, the new-design Trolleyphone will withstand the most severe vibration in mine use, the maker says. Circle No. 1 on card for full data from *Farmers Engineering & Mfg. Co., Pittsburgh 22.*

You May Find Answers to Your Job Problems in These Helpful Equipment Bulletins

(2) MINING-MACHINE CUTTER CHAINS AND BITS in its line are thoroughly described and illustrated in the new 34-p catalog issued by the Precision Chain Co., Terre Haute, Ind. In addition to a complete description of the operating and design features of each item, the booklet contains a complete parts list, instructions for installation and ordering, and chain-lacing charts.

(3) VIBRATING-SCREEN CATALOG gives full data on Link-Belt Model UP vibrating screens designed for the fast accurate dry-screening of light and fine materials and Model NRM liquid vibrating screens for low-cost high-speed separation of solids from liquids, both available in a wide range of sizes. Descriptive material in the 20-p Bulletin 2377 includes specific selection information, dimension tables, weights, horsepower requirements and other data of value to the engineer and plant operator. Available from Link-Belt Co., Chicago 1.

(4) CABLE-REEL SHUTTLE CARS for low-coal, the Goodman Types 370-371 featuring 4-wheel drive, a 35-in basic height and an adjustable elevating discharge hydraulically controlled, are discussed

USE the Postage-Free Card Between pp 124-125 to Get More Data on the New Products or the Bulletins Described on This and Other Pages of This Section—Just Circle the Item Numbers, Sign and Mail the Card.

in Bulletin CLTS-512 offered by Goodman Mfg. Co., Chicago 9. The folder gives complete details of design, operation, features and specifications.

(5) "HOW TO SELECT" ELECTRICAL MEASURING INSTRUMENTS is the subject of 30-p Booklet B-4696 available from the Westinghouse Electric Corp., Pittsburgh 30. Basic selection factors are discussed and charted, with the complete lines of portable, switchboard, panel, recording, and socket instruments described and illustrated, and their functions explained.

(6) BELT-CONVEYOR IDLERS AND MACHINERY in the Chain Belt Rex line are thoroughly covered in the 44-p Bulletin 51-81, which offers data on all of the latest designs and developments, general engineering information to help in designing and specifying belt-idler equipment, the latest data on lubrication techniques and useful information on correct maintenance procedure. Complete specification data are included. Available from Chain Belt Co., Dept. PR, Milwaukee 4, Wis.

(7) DC SECTIONALIZERS — Electric Controller & Mfg. Co., Cleveland 4, offers Folder 1402 describing the features and operation of its new DC sectionalizer for stub-end mine feeders featuring a new automatic feeler-circuit said to intermittently test the load side to eliminate fire and shock hazards present with the conventional automatic reclosing circuit breakers. The units are built in 300-, 600-, 800- and 1,350-amp sizes.

(8) FOR STRIPPERS, Catalog 189 entitled "ESCO Dipper Buckets for Every Digging Condition," describes and illustrates all types of ESCO dippers, with specifications and operating data on the ESCO general-purpose cast-welded dipper, all-cast manganese-steel dipper, coal-loading dipper and the Fastback hoe dipper. From Electric Steel Foundry, Portland 10, Ore.

MORE Useful Equipment Bulletins and New Products Are Described on the Pages Following.

New Machine Bit Developed for Severe Cutting Conditions

A new cutter bit, Style UR, is being manufactured by Kennametal Inc., Latrobe, Pa. Bit is designed for faster cutting where shock conditions are severe, such as in the Continuous Miner, and in seams having large amounts of rock and other hard impurities. Features of the new UR Bit are its hard insert of Kennametal tungsten-carbide, and a special shank design that holds the insert firmly on four surfaces. Performance to date shows reduced cutting costs in rugged, rock-laminated seams.

●

Hollow Drill Rod For Roof Pinning

Hollow drill steels have been adapted by Kennametal engineers for use in the wet drilling of roof bolt holes. A square hole is formed at the end of the rod to accommodate the Kennametal HFD Bit. The bit has been adapted for wet drilling by grooving two sides of the shank to afford a passage for water. The advantage of water, besides controlling silica dust, is increased bit life.

●

Coal Company Reduces Bit Cost 50 Percent

Peters Creek Coal Company Superintendent, James Savilla, reports that bit cost over a base period of two months has been reduced approximately 50% by changing from steel to Kennametal. The cost reported was $187 for the use of steel, $92.50 over the same period using Kennametal. Other advantages in speed, and ability to drill rock were cited.

●

Ivan J. (Dutch) Kinter Joins Kennametal Sales and Service

With the appointment of Ivan J. (Dutch) Kinter, effective July 1, as a Kennametal sales and service representative, Kennametal has representation in all of the major coal and non-metallic mineral producing centers of the United States. Mr. Kinter's territory will include eastern and southern Colorado, New Mexico, and Arizona. His headquarters will be in Carlsbad, N. M.

FAST WAY to drill ANY roof

Your mine roof, whether medium or hard, can be drilled faster and more easily with one of the types of Kennametal Bits illustrated above.

The RD Bit, with prongs angled for strong digging action, rotary drills boney, shale, and slate. The sturdy HFD Bit is used in the hardest material that can be rotary drilled with a carbide cutting edge, offers added drilling speed because the slotted-blade design eliminates the point of zero velocity. In formations too hard for rotary drilling, the PT Bit, with three Kennametal blades, gives more footage, faster (by about 10%), than any other multiple-point bit, and minimizes the tendency to over-penetrate when entering softer roof.

These bits can do a better job for you because (1) their unique Kennametal cutting edges resist wear and shock better than any other carbide, stay sharp up to 100 times longer than steel and (2) Kennametal tool design—often imitated but never equalled—assures great strength and smoother, safer, trouble-free operation.

One, or all, of these Kennametal Bits can help you get fast, low-cost roof-drilling. Your Kennametal representative will be glad to go into your mine and demonstrate them for you. Contact him today! Kennametal Inc., Latrobe, Pa.

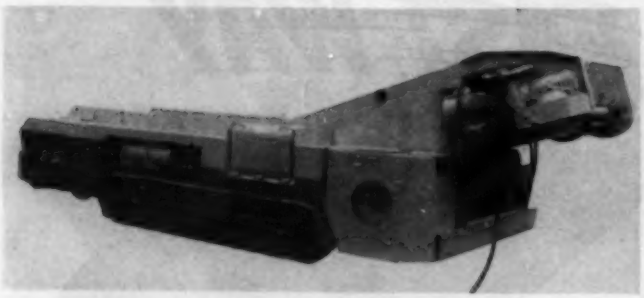
Names of Kennametal Representatives appear in the McGraw-Hill Mining Catalogs

KENNAMETAL®

DRILL BITS • MACHINE BITS • ROCK BITS • ROOF BITS

Specialists in Coal Cutting and Coal Drilling with Tungsten-Carbide Tools

(ADVERTISEMENT)



Crawler Shuttle Car Features High Maneuverability (9)

New General Electric 6-ton cable-reel crawler-type steel-track shuttle car, designed for operation in close quarters, has a turning radius of 14 to 16 ft and provides for light ground-loading pressure per square inch by distributing weight over a large ground area, the maker says. The car's improved maneuverability is indicated by its ability to turn by locking one track completely and since no clearance is required for turning wheels a much wider conveyor, permitting increased unloading speeds, is built into the unit without adding to the overall width. Two steering levers operate the tracks, each powered by a 20-hp 250-v motor through a single gear reduction, chain and sprocket. The 600-ft-capacity cable reel is hydraulically driven and all internal control elements are in sealed-type cases. Full details from *General Electric Co., Schenectady 5, N. Y.*

Side-Dump Semitrailers Haul up to 30 Tons (10)

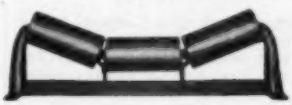
New gooseneck semitrailers said to utilize two of the most popular Easton side-dump body designs include the Model TL-1015 (left), a lift-door unit of 15 tons capacity designed for service with the Caterpillar DW-10 diesel tractor. The lift-door body is especially built for fixed-point dumping, using the Easton electric overhead dumping system, with a maximum dumping angle of 70 deg. Body and trailer frame are of all-welded steel construction, with heavy box-section reinforcements throughout, and the trailer is equipped with Bendix-Westinghouse air brakes and 21.00x25 20-ply-rating tires. Units of the same design will be available up to 30 tons capacity and the new line also will include 15- and 30-ton automatic drop-door hydraulically dumped units.—*Easton Car & Construction Co., Easton, Pa.*

Diesel-Engine Changes Prolong Service (11)

Among the several improvements designed to prolong engine life and further reduce upkeep of General Motors Series 71 diesels recently announced is a revolutionary method of oil, water and compression sealing between the engine block and head which does away with the laminated gasket commonly used in internal combustion engines. Reported by the company as the most fundamental design change ever made in the Series 71 diesel engine, the new method is offered as superior to any other gasketing method. To provide "freer breathing" in the engine and longer valve life, the angle of the exhaust face and the valve seat inserts has been changed from 45 to 30 deg, thus reducing the turbulence of escaping exhaust gases and scavenging air, it is said. Other new design features cited include roll-burnished crankshaft fillets and peened oil holes in the Tocco-hardened crankshaft, and re-design of the block to improve the retention of intermediate camshaft bearings by installing longer retaining screws. The improvements are incorporated in current models of 3-, 4-, and 6-cylinder single Series 71 GM diesels and multiple-engine units ranging from 51 to 800 bhp. *Detroit Diesel Engine Div., General Motors Corp., Detroit 28.*

Rubber Molding Lengthens Screen-Cloth Life (12)

A new type of rubber molding for vibrating screens which snaps on to cross members supporting the screen cloth to eliminate one of the major causes of screen-cloth breakage now is standard on the complete line of vibrating screens made by the Deister Machine Co. The new mountings, which also can be easily applied to Deister Machine screens now in operation, eliminates so-called "line contact" at the point where the screen normally whips against support tubes, it is said. At this point (indicated by pencil point above), the new molding presents a wide flat special rubber surface to the cloth to reduce abrasion and spread the point of contact to reduce friction and the possibility of later breakage. Full details from *Deister Machine Co., Ft. Wayne 4, Ind.*



Prelubricated Idlers Cut Operating Costs (13)

Newly improved line of Transall prelubricated belt-conveyor idlers which require no future lubrication combine contact-sealed high-speed heavy-duty ball bearings and special mounting features that work together to effectively exclude foreign material and retain bearing lubricant, the maker says. The units also operate with a very low friction factor to reduce conveyor horsepower requirements and permit use of smaller diameter idler rolls without sacrifice of idler life or conveyor dependability even in the most severe service, it is reported. In addition to reducing maintenance costs, prelubrication eliminates grease injury to belt and accompanying fire hazards. Idler-frame construction is all steel jig-welded, designed to provide a sturdy accurately aligned frame that insures uniform belt training under all loading conditions. The solid-roll shafts extend completely through the idler roll and are mounted

Jud Jarrells says:

"We heave 'er up with . . .

Judson Jarrells, Drilling and Blasting Foreman at the Badgett Mine Stripping Co., Madisonville, Kentucky.

AMERICAN CYANAMID COMPANY

EXPLOSIVES

. . . and what's left is easy picking"

In West Kentucky recently, the Badgett Mine Stripping Company faced the problem of breaking up a 35 foot layer of sandstone overburden resting on Kentucky No. 12 coal.

American Explosive Engineers, working closely with the drilling and blasting foreman, Judson Jarrells, solved this problem by using American Explosives CX 176-C, 4½ x 28. These were loaded into 125 foot holes on 25 foot centers and the blast touched off.

Results? The sandstone was broken up perfectly in a box cut and could be easily handled by the shovel.

Our field engineers can help you select the grade of explosive that will do the job you require. Available in a wide variety of densities and velocities, American Explosives can be obtained from any of several plants and distributing magazines conveniently located in key areas.

Capable Field Engineers Are Available at Your Call

AMERICAN *Cyanamid* COMPANY

Explosives Department

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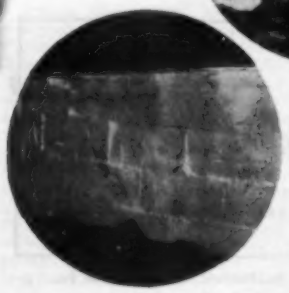
sealing methods cut air costs as much as...30%

● Mine operators are reporting up to 30 per cent savings on air—just one example of the ways Cocoon can reduce your operating costs! When used on permanent, temporary or dry block stoppings, Cocoon does a more complete, more lasting job of sealing. With Cocoon in use, your fans do less work and you pay less for power!

Cocoon has *so many* advantages . . . it's *so easy* to adopt as a method! Write us about a demonstration in your mines. It pays *cash* to use Cocoon!

Step 1: Dry block stopping before being sealed. Cocoon seals cement block stoppings and overcasts, and prevents spalling in air course.

Step 2: Stopping covered with cloth. Cocoon portable spray equipment in foreground.



Step 3: Stopping sealed by spray application of Cocoon film. Red dye is used to insure complete, even coverage. A single application of Cocoon gives positive sealing.

MORE ADVANTAGES OF COCOON!

1. Seals roofs against scaling and spalling.
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4. Will not support combustion.
5. Whiz Cocoon is the original plastic spray coating—backed by 60 years of industrial-chemical experience.

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Industrial-Aviation Division

R. M. HOLLINGSHEAD CORPORATION

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to eliminate all cantilever loading on the roll ends. — More data from *Truscell, Inc., Birmingham 5, Ala.*

New Respirators Approved By Mines Bureau (14)

New line of Bureau of Mines approved chemical-cartridge respirators announced by Willson Products is known as the 800 Series and includes styles for protection against low concentrations of many common industrial gases and vapors, as well as metal fumes, mists and dusts. Principal features cited by the maker are: newly designed facepiece with feathered rolled edges for snug, comfortable fit; exhalation valve positioned to minimize dust interfering with normal operation; choice of three cartridges sizes, 60, 85 and 100 cc; and double adjustable elastic headbands. Descriptive bulletin available from *Willson Products, Inc., Reading, Pa.*

New-Type Mercury Lamp More Efficient (15)

A basically new industrial light source, the 400-Westinghouse J-H1 fluorescent mercury-vapor lamp, is designed to provide a whiter light from a mercury-vapor source, which makes operation at lower mounting heights practical and widens the field of use for mercury lamps, the maker says. Equipped with a BT-37 bulb with an isothermal shape that provides an even operating temperature over the entire bulb wall, the new lamp will burn in any position and can be used in existing fixtures for 400-mercury lamps. Increased fixture efficiency is obtained by removing the diffusing shield frequently used with the A-H1 type. In addition to industrial use, this new lamp can be effectively used for flood and street lighting, it is said. More information from *Westinghouse Electric Corp., Lamp Div., Bloomfield, N. J.*

YES—I would like more information . . .

Please send me catalogs or further information about the items from the Equipment News Section whose numbers are circled (October 1951)

1	6	11	16	21	26	31	36	41
2	7	12	17	22	27	32	37	42
3	8	13	18	23	28	33	38	43
4	9	14	19	24	29	34	39	44
5	10	15	20	25	30	35	40	

In addition, please send me data on these OTHER products advertised in this issue (give name and page number) .....

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. . . TO GET MORE INFORMATION on products and bulletins mentioned in this Equipment News Section or for data on any product advertised in this issue. Circle item numbers, tear out and mail.

Equipment Shorts You'll Want to Check

(16) NEW-TYPE FIRE DETECTOR fits snugly and unobtrusively against the ceiling of a building to give instant warning at any preset temperature up to 325 deg F without a time lag. It can be installed within new or existing alarm systems or can be made to directly actuate an extinguishing system. One unit can protect an area up to 625 sq ft, automatically resetting itself after each alarm, it is said. —*Fenwal, Inc., Ashland, Mass.*

(17) PORTABLE HIGH-CURRENT TEST UNIT, Multi-Amp Model 100B is designed for testing and calibrating current-actuated devices, such as, overload relays for any AC motor, circuit breakers, current transformers, instruments and relays. The unit supplies any current from 0 to 500 amp, operating on either 110 or 220 v, 60 cycles, AC, and also features a built-in 4-in ammeter accurate to 1% on all ranges: 25, 50, 250 and 500 amp. Bulletin C-1006-251 giving details offered by *Multi-Amp Corp., Harrison, N. J.*

(18) COMPRESSED-AIR CLEANER —Model B Condensifilter, designed to remove water, oil, sludge and other foreign materials from compressed air, combines in a single unit a dehydrating device, a mechanical filter and a self-purging trap that provides dry, clean compressed air for operating instruments. Measuring only 18 in high by 9 in in diameter, it has a capacity of 30 cfm at 100 psi. To provide higher capacities, Condensifilters may be installed in parallel.— *Hankison Corp., Pittsburgh 30.*

(19) NEW SHEATHED ELECTRIC-HEATING ELEMENT for various industrial heating applications provides flat surfaces for contact heating and a thin section for convection and air flow, may be readily bent and formed,

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THE EDITOR, COAL AGE

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and is resistant to moisture and vibration, the maker says. A variety of terminals are available or the heaters may be brazed or welded into various fittings or provided with hold-down straps or brackets. The ⅝₂-in-thick flat units may be furnished in various sheathing material, in heated lengths up to 10 ft and in widths of ⅝₂ and 1⅛ in. Bulletin with full data from *Syntron Co., Homer City, Pa.*

(30) LIGHTWEIGHT SPUR-GEAR HOIST, the new ½- and 1-ton Coffing "Challenger," offers high strength and ease of servicing, the maker reports. The entire unit, including high-strength coil chain for an 8-ft lift, weighs only 39½ lb and thus is easily moved from one place to another as needed. Other features cited by the maker include unusual resistance to shock-load breakage through the use of formed steel plate in the housing; a design that permits disassembling in a matter of minutes with simple tools; and sealed-in lubricant. Further data from the *Coffing Hoist Co., Danville, Ill.*

(31) TRACTOR MAINTENANCE—Latest in Caterpillar Tractor's campaign of "Machine Care for Longer Wear" is a weld-on plate for resurfacing track links worn too deeply for the successful use of weld overlays. Applied to D7 and D8 tractors, the new method makes it possible to resurface track links worn in excess of ¾ in. As soon as track links are worn through the original surface hardness of about ⅛ in, weld overlays, which are effective up to three thicknesses, or about ⅜ in, should be used, Caterpillar recommends, advising that its dealers now offer these parts rebuilding service.—*Caterpillar Tractor Co., Peoria 9, Ill.*

(32) NEW ALL-PURPOSE LUBRICANT of the Bentone type, known as "Hood Multiplex Lubricant," is produced in grades from No. 00 to No. 3 and utilizes a bodying agent that gives complete stability under all service and storage conditions, the maker says. It has no melting point and retains lubricity and adhesive characteristics under all normal temperature conditions. While insoluble in water, the lubricant will absorb moisture in service without losing adhesive or lubricating qualities, and thus is recommended by the maker for use wherever water or moisture is a problem.—*Hood Refining Co., Greensburg, Pa.*

(33) NEW-TYPE MANILA ROPE, known as Se-Lectric rope, is said by the maker to resist water absorption and possess unusual electrical nonconductivity characteristics that provide a high safety factor. Specifically developed for the protection of linemen, maintenance men and others facing electrical hazards, the chemically treated Se-Lectric rope is fully flexible, resists decay and wears longer, yet is comparable in price to the manila ropes, it is said.—Literature and samples available from *South-Eastern Cordage, NBC Bldg., Cleveland 14.*

(34) TO EXTINGUISH FIRES of the flammable liquid and electrical type, new 1-qt air-pressurized extinguisher known as the Alfco Pressurized Fire-Gun aims and operates like a gun by squeezing the trigger to discharge vaporizing liquid fluid. It requires no pumping and may be easily repressurized with a standard air chuck commonly used in gasoline service stations.—*American-LaFrance-Foamite Corp., Elmira, N. Y.*

(35) SELENIUM RECTIFIERS — New custom-made AC to DC rectifier power conversion units of high current and voltage capacities are made possible by the manufacture of extra large selenium-rectifier cells by Syntron's new vacuum process, the company says. Use of the larger cells permits fewer parallel elements for a given DC output and at the same time keeps weight and size to a minimum, it says. Full details are available from *Syntron Co., Homer City, Pa.*

EQUIPMENT BULLETINS AVAILABLE

(More Bulletins Listed on P 120)

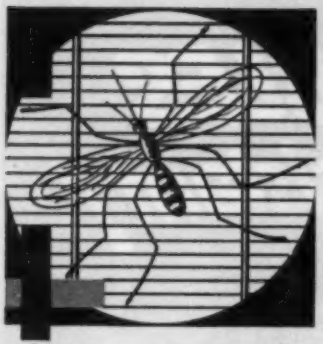
(26) ROCK-DUST DISTRIBUTOR—Bulletin offered by the American Mine Door Co., Canton, Ohio, fully describes the construction and operation of the "Little Chief" duster, especially designed to cut back-breaking labor in moving a machine from room to room in low coal. The unit is available with a winch for pulling itself on and off a conveyor and also as a rubber-tired model.

(27) CHAIN-DRIVE SELECTION is easier with the new Whitney Catalog HD-51, compiled to offer a simple quick means of determining interchangeability of various makes of roller and conveyor chains. Proper application of chain drives also is discussed. Available from the Whitney Chain Co., Hartford 2, Conn.

(28) POWER SHOVEL—Manitowoc Model 2000, 25-ton crane and 1¼-yd shovel is thoroughly described in 12-p Catalog 20-51 which explains for the first time such new features as the new shovel crowd-chain arrangement and swivel-type dragline fairlead. Along with individual diagrams that show working ranges for crane, hoe, and standard and high-lift shovel attachments, a crane capacity chart covers the full lifting range from 25 tons at 12-ft radius to 100-ft boom a 70-ft radius. Available from Manitowoc Engineering Works, Manitowoc, Wis.

(29) HEAVY-DUTY MOTOR TRUCKS in the Federal line, including 6-wheelers, are illustrated in a new bulletin issued by the Federal Motor Truck Co., Detroit 9. The folder covers Federal gasoline and diesel engines, special heavy-duty construction features and specifications on the complete line.

(30) SQUIRREL-CAGE INDUCTION MOTORS made by Allis-Chalmers Mfg. Co., Milwaukee 1, for a wide



Better screening with
BEE-ZEE
round rod screens

Better screening means less coal being lost to the slurry pile — *more money* for you! Let Bee-Zee Screens give greater efficiency to your coal screening equipment than you believed possible!

ROUND TOP RODS

means that screens can wear halfway through before screen opening changes . . . one reason why coal operators report Bee-Zee Screens last 10, 20 — even 30 times longer.

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between round top and tie rods forms no "pockets" to cause blinding or clogging. This means faster dewatering, too — preventing wintertime freeze-ups.

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Bee-Zee Screens can be fitted to any coal processing equipment.
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Equipment Bulletins of Interest—Cont'd

range of applications in ratings and speeds up to 1,750 hp at 1,800 rpm are thoroughly covered in Bulletin 05B7542A. Construction features discussed include welded stator yoke, long-life stator winding, capsule-type housings, split-sleeve bearings, air-gap access holes, silver-brazed cage, protecting end shields, large discharge openings, drip-proof design.

(31) A WIDE RANGE OF EARTH-MOVING, material-handling, lifting and carrying jobs performed by the multi-purpose Payloader tractor-shovels is shown in a new 12-p catalog published by the Frank G. Hough Co., Libertyville, Ill. Entitled "Profitable Construction with Payloaders," the booklet includes helpful job data, specifications and features of the complete line, together with accessories.

(32) TO SPEED WELDER OPERATION, Joy push-lock-type plugs for portable feeder cable are specially designed for welding needs, being easily engaged yet almost impossible to disconnect accidentally, new Bulletin SM-2 reports. Molded as one-piece neoprene rubber units, the plugs are available molded to cable lengths of customer's specifications or in the newly developed attachable type. Bulletin offered by Joy Mfg. Co., Dept. N-34, Pittsburgh 22.

(33) ROLLER CHAINS AND SPROCKETS you can get from stock at factory branches and distributors are covered in Catalog C55-50, released by Morse Chain Co., Detroit 8. It gives list prices, available sizes of Types A, B and C Morse stock sprockets, and pertinent information on Morse stock roller chain from ⅜ to 2-in pitch, along with data on drive selection, service factors, installation and service.

(34) MOTOR STARTERS—Arrow-Hart "Explo-Safe" and weatherproof motor starters for hazardous locations are smaller and lighter than conventional motor starters because of their patented right-angle "RA" mechanism, according to new 8-p folder issued by the company. The bulletin gives complete data, including dimensions, weights, ratings and wiring diagrams for these magnetic across-the-line starters. Offered by Industrial Control Div., Arrow-Hart & Hageman Electric Co., Hartford 6.

(35) FOR THAWING FROZEN HOPPER CARS, two types of Hauck portable thawing-tube units are described in Bulletin 1063A offered by the Hauck Mfg. Co., Brooklyn 15, N. Y. Features and operation of the equipment are discussed in detail in the folder, which also gives prices.

(36) PIPING—Bulletin 506 available from Taylor Forge & Pipe Works, Chicago 90, offers detailed specification and strength data on Taylor Spiral-Weld pipe in diameters from 6 to 36 in, fittings, coatings, etc.

(37) TACKLE BLOCKS — Upson-Walton Co., Cleveland 11, has published a 52-p Catalog 51-B which presents comprehensive data in five major divisions: (1) how to order Upson-Walton tackle blocks; (2) Upson-Walton policy service; (3) design features; (4) mechanics and operation of tackle blocks; and (5) size, service and design data on the company's complete line of tackle blocks.

(38) THE RIGHT FIRE EXTINGUISHER to use on rubbish, wood, inammable liquid or electrical-type fires, is illustrated in a new 12x22-in 2-color poster available in quantity from Randolph Laboratories, Inc., Chicago 11. Designed for posting at strategic locations and for use in fire schools and employee lectures, the guide illustrates all standard-type fire extinguishers and graphically explains the proper use of soda-acid, pump-tank, foam, carbon-dioxide, carbon-tetrachloride and dry powder extinguishers.

(39) PRE-MEASURED MANILA AND SISAL ROPE available in a new self-dispensing carton that simplifies use and storage, with sizes, types and lengths available, are listed in Data Sheet 7903 released by the New Bedford Cordage Co., New Bedford, Mass.

(40) WHERE AND HOW TO USE open steel flooring is illustrated with many varied installation photos in a 16-p "Idea Book" released by the Open Steel Flooring Institute, Inc., Pittsburgh 22. The booklet explains types, features and proper use.

(41) STANDARDIZED HEAVY-MEDIA COAL-CLEANING PLANTS built by Nelson L. Davis Co., Chicago 4, in six sizes from 50 to 325 tph for any size range from ¼ to 10 in, are covered in Book 151 just issued. Complete operating and performance details are included, along with dimension drawings.

(42) MINE HOISTS available in various sizes and types to meet specific hoisting requirements are illustrated and described in 24-p Bulletin 190 offered by the Nordberg Mfg. Co., Milwaukee 7. Various actual installations are pictured together with pertinent engineering data.

(43) HOW TO RESTORE SERVICE OF STORAGE BATTERIES which have lost capacity from "sulphation," because of continued undercharging while in use or prolonged idleness without charge, is explained in a data sheet now available from Gould-National Batteries, Inc., Trenton 7, N. J.

(44) EFFECTIVE OUTDOOR INDUSTRIAL LIGHTING is thoroughly covered in 24-p Booklet B-4791, including application techniques and suggestions, power distribution, control systems and mounting. Offered by Westinghouse Electric Corp., Pittsburgh 30.

U.S. ROYAL CABLES are Moisture Resistant!

Moisture Absorption Test...

In one of the seven "torture" tests given to this cable, a sample of Royal jacket (0.100 inch thickness) is first weighed, then immersed in distilled water at 70 degrees C for seven days. It is then removed and weighed and the amount of water absorbed is calculated. U. S. Royal Mining Machine Cable's jacket absorption is never more than 60 milligrams per sq. in.

7 reasons why U.S. Royal Cables mean safety:

Seven gruelling laboratory tests, each of them tougher than actual conditions, guarantee U. S. Royal's resistance to moisture, abrasion, cutting, heat, cold, impact, flexing. United States Rubber engineers spare no effort in making sure U. S. Royal is a completely safe electrical cable. Write Electrical Wire and Cable Department, United States Rubber Company, Rockefeller Center, New York 20, N. Y.

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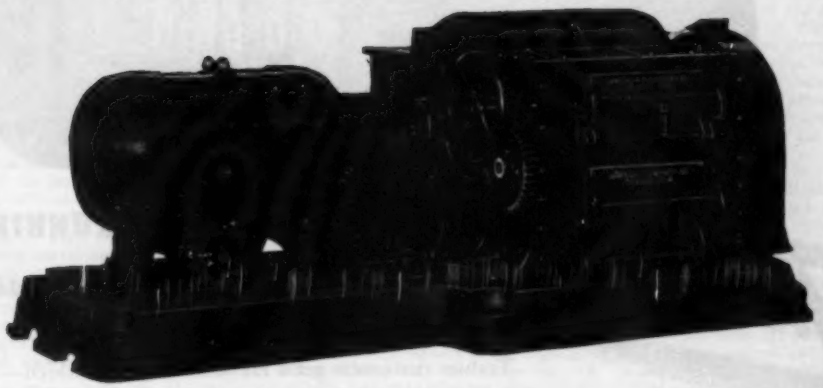
SERVING THROUGH SCIENCE
UNITED STATES RUBBER COMPANY

U. S. ROYAL MINING MACHINE AND LOCOMOTIVE CABLES

CASE HISTORY No. 1

"CRUSHING" FACTS on American Crusher PERFORMANCE

(Taken From An Independent Survey)



AC-7-C REDUCES 12" ROM COAL TO MINUS 1"—AT 550 TPH

"Operating at 10% Beyond Rated Capacity . . . 10% Under Power Capacity"

Here's the whole production story on this American AC-7-C, installed in a South Carolina Power Plant . . . reducing 12" ROM lumps to —1" at 50 tons per hour in excess of the factory-rated capacity —and doing it on only 90% of the potential motor load!

Once again, the efficient American-originated Shredder Ring Crusher has proved its ability to produce more on lower power needs.

Why not let us tell you the full story? Write for literature today.

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keeps them out of the repair shop!

Trabon customers get a lubricating system which—day after day and year after year—properly lubricates bearings, with a minimum of down time and maintenance.

Trabon oil and grease systems give positive, automatic lubrication on coal crushers, washers, shakers, conveyors, screens and underground equipment. No shutdowns for bearing failure... No work stoppage for lubrication... Trabon lubricates as your machines produce.

Repeat orders from customers prove the merit of Trabon. There are more Trabon automatic lubricating systems in operation than all other makes!

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News In Brief

P&R Offers 4-Yr Scholarship

To encourage young men in the southern anthracite region who may not otherwise have the opportunity to study mining engineering, the Philadelphia & Reading Coal & Iron Co. has established a 4-yr scholarship in mining engineering that will be awarded annually, Edward G. Fox, company president, announced Sept. 8. To be known as the Ralph E. Taggart Memorial Scholarship in memory of the late president of P&R, the grant will be open to all graduates finishing in the upper half of their classes in high schools in the three company operating divisions, and may be used at the mining schools of Lehigh University, Lafayette College or Penn State College. First winner of the award is Robert Zmudzin, a 1951 graduate of Coal Township High School, who will attend State College.

Diesel Motor Hits W. Va. Snag

Underground operation of the USBM-approved diesel locomotive is illegal in West Virginia, according to the state's attorney general's interpretation of the 1915 mine law released Aug. 28. Arch J. Alexander, chief of the state Mines Department, said that he had interpreted the law to permit use of the diesel if approved by a state mine inspector and that he believed the law should be changed since the attorney general's ruling makes the law "stand in the way of progress." Mr. Alexander pointed out that the USBM had approved the diesel mine locomotive (see p 98 of this issue) and said: "If we cannot accept the Bureau's standards on this, we cannot accept them in anything." Several days later, officials of the Pond Creek Pocahontas Co., which purchased the first underground diesel built, announced that use of the unit underground would be postponed in view of the state's ruling.

Two Ky. UMWA Locals In Fight Before NLRB

Acting in a case rare in the history of the UMWA, the National Labor Relations Board Aug. 20 held a hearing in Jenkins, Ky., on charges of unfair labor practices brought by members of the local union at Mine 207 against members of the local at Mine 214. Both are mines of the Consolidation Coal Co. (Ky.), Div. of Pittsburgh Consolidation Coal Co., and it was erroneously reported in some newspapers, at first, that the charges had been brought against Consol. Two members of the Mine 207 local, acting for themselves and 54 others, had filed charges of discrimination and coercion by members of the 214 local for using force and intimidation to prevent them from transferring to Mine 214 and demanded

(*Continued on p 150*)

Coal-to-Gas Needs More Study; Plant Snagged

Commercially successful conversion of coal into gaseous and liquid fuels requires a better understanding of the chemistry involved in such processing. At least, that is the conclusion of two members of the research and development staff of Pittsburgh Consolidation Coal Co., Dr. G. E. Goring and George P. Curran, who reported some of Pittsburgh Consol's research findings in papers presented before the meeting of the American Chemical Society in New York early last month.

Commenting on the papers, Dr. Howard S. Turner, director of Pittsburgh Consol's research and development division, said: "Conversion of coal to a gas, and to a liquid fuel such as gasoline, offers prospects of a tremendous new market for coal. Such conversion will, however, have to be brought into a cost range that will permit these synthetic fuels to be sold in true competition with natural gas and petroleum products.

"Attacking this problem through improvement of Germany's war-born synthetic-fuel processes is too limited an approach and so far shows little promise of achieving the cost reduction required. This goal can be reach-

Featured in This Section

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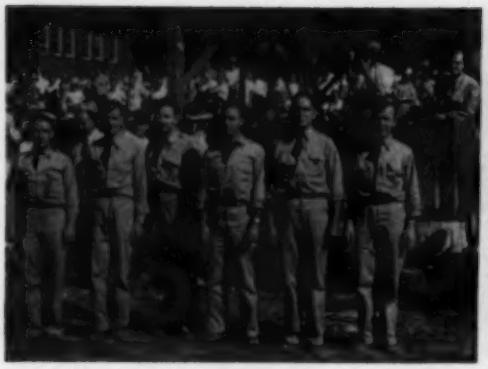
Preparation Facilities	p 178
New Books for Coal Men	p 180

ADD THINGS TO DO WITH STRIP-MINED LAND—Employee's club on property of Northern Illinois Coal Co., Wilmington, Ill., complete with lake for swimming and fishing; springboard, float and diving tower; picnic area and playground; swings and see-saws; clubhouse and bathhouse; flowers, trees and shrubs. The company provided the land and construction machinery. Employees, including mineworkers and supervisors, did the rest. Annual membership fee is modest.



Red Jacket Safety Day Sponsored by Company and Union

MORE THAN 3,000 EMPLOYEES and members of their families attended the second annual Family Picnic and Safety Day of the Red Jacket Coal Corp., held Aug. 4 at Red Jacket, W. Va., under the joint sponsorship of the company and UMWA locals. Participating in the first-aid and mine-rescue competitions were nine teams from the company's mines, together with one boys and two girls teams. Merchandise prizes valued at $2,300 donated by the coal company and union locals were awarded during the activities and cash prizes presented to the winning teams totaled more than $500. Arch J. Alexander, chief of the W. Va. Department of Mines, acted as director of the first-aid meet, and E. E. Quenon, USBM, was director of mine rescue. Other state and federal officials, as well as international and local union officials, participated in the program.

Winner in the first-aid meet was the team from Coal Mountain mine (left photo) composed of Raymond Woodward (left), captain, James Hoskins, Floyd Barnett, Noah Woolum, Joe Morell and William Woodward. William M. Ritter, Red Jacket vice president and general manager, shown on the stand at the right, acted as director of the program.

Top team in the mine rescue was that from Junior mine (right), including Lewis Simpkins (left), captain, Nakomis Sloan, George Williamson Jr., John Halley, Benny Chafin.

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ed, but only by recognizing the need for new basic facts on the chemistry of coal's conversion, the kind of facts which lead to entirely new process ideas, and to far-reaching improvement in present-known processes."

Meanwhile, the go-ahead for a privately financed coal-to-oil plant being encouraged by the Department of the Interior (*Coal Age*, September, p 127) appeared to be bogging down, reports from Washington indicated last month. Construction of the plant is being considered by Colchem Corp., a subsidiary of the New York investment firm of F. Eberstadt & Co., with the expectation that sale of its much-in-demand chemical products would make its operation profitable. Key point in Colchem's negotiation with the Interior Department is a 12-yr guarantee of prices for the unsold chemicals, and coal produced. To provide this, Secretary Chapman has asked the Defense Production Administration to set aside $415 million.

According to reports, the Secretary's request is bringing to the surface considerable opposition to the immediate construction of such a plant. Some Bureau of Mines and other Interior officials feel that final plans should be delayed until current synthetic-fuels studies are completed and question whether coal, lignite or oil shale should be used as the raw material. In the DPA, these questions are complicated by the fact that the plant would require some 200,000 tons of steel, a large allocation in view of present shortages. The House Interstate Commerce Committee reportedly is investigating the terms of the proposed contract, with particular interest in the guarantee.

On the local level, $10,000 is being sought by the Moffat County Synthetics Products Corp. to complete a detailed study of an area near Craig, Colo., said by the organization to be ideal for the location of a plant to produce coal from oil. The non-profit organization would use part of the money raised to file on water and coal rights. At the same time, a group of business men in Sheridan, Wyo., headed by Walter G. Johnson, president of the Sheridan-Wyoming Coal Co., were reported to be actively working to encourage government location of a full-scale coal-hydrogenation plant in that area, on the basis that unlimited coal reserves and water supplies are immediately available.

Hit of the Show!

"DRESSED IN COAL," Miss Judy Stechow did much to attract large crowds to the display of products made from coal sponsored by the Tuscarawas Deep Mine Coal Operators at the Tuscarawas Valley Exposition, held in Dover, Ohio, Aug. 8-12. Miss Stechow, who is a singer on Station WJER as well as traffic manager of the station, was pictured in a front-page story in the Dover newspaper and her appearance also was advertised by the coal group in the newspapers and over two radio stations. The display, which also included modern coal-burning equipment and a guessing game to induce prospects to register, is an unusual example of cooperative promotion on the local level, since all of the eight companies cooperating except one have small operations. Secretary of the Tuscarawas Operators group is J. Robert Hartz, of the Hartz Coal Mines, New Philadelphia, Ohio.

70% Deeper Traction Tread!

For the first time highway performance matches off-the-road efficiency! *The proof is in!* Fleet operators acclaim U. S. Royals as the first to completely fulfill the tough on-and-off-the-road operating demands. That's because tread and carcass are *job-fitted* to give new *penetration* and *traction off the road* plus—*smooth, long-wearing, non-skid mileage on the highway.*

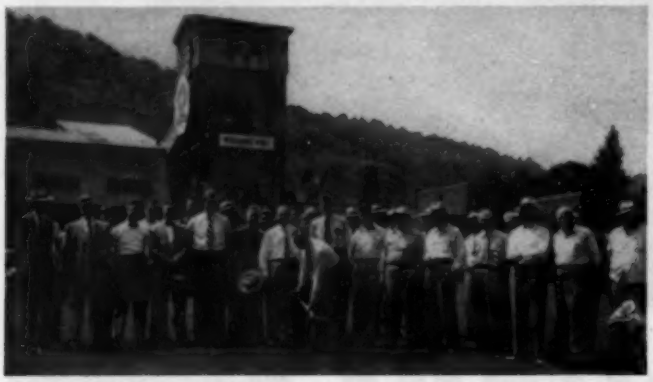
Here's what the Fleetmaster gives you:

- ★ *70% deeper traction tread!*
- ★ *Tougher, stronger carcass! (More Recaps)*
- ★ *Specialized tread compounds!*
- ★ *Thicker under-tread!*
- ★ *Round-molded to the tire's inflated shape to reduce distortion stress and strain!*

Your proof is at your U. S. Royal Dealer's. A phone call gets it for you—he's listed in the Classified Telephone Book.

UNITED STATES RUBBER COMPANY

New Mine Developments



Consol (W. Va.) Modernizes Williams Mine With New 8,500-TPD Washery

GEORGE R. HIGINBOTHAM, president, Consolidation Coal Co. (W. Va.), Div. of Pittsburgh Consolidation Coal Co., takes his turn at the official ground-breaking ceremony for the new Williams mine preparation plant, recently announced as an important step in the company's modernization program.

Planned to produce 8,500 tpd of washed coal, double the present output, with provision for a wide choice of sizes to meet market requirements, the plant is being constructed by the Fairmont Machinery Co. for completion late in 1952 and will be served jointly by the B. & O. and Western Maryland railroads.

Unlike any other Pittsburgh-seam operation in the Fairmont region, the plant will employ two distinct and separate coal-cleaning circuits, one handling 5x⅜ in and the other ⅜x0. The ⅜x0 will be cleaned on 16 Deister coal-washing tables at a rate of 134 tph and then pass to three centrifugal driers and two heat driers for a final reduction in surface moisture to about 2%. The 5x⅜-in raw coal, at 313 tph, will be fed into a 15-ft-diameter Chance cone, for the preparation of four sizes in this circuit which can be loaded separately or in various combinations.

Four loading tracks are to be provided and the building structure will be entirely enclosed, without windows. A complete dust-collecting system will be installed to collect all dust at its source and oil treatment will be provided for several sizes. Space is also being provided for the addition of eight coal-washing tables, two centrifugal and one heat driers, which would be necessary if mine face operation should convert to continuous mining machines in the future and more ⅜x0 resulted.

With a virgin tract containing 80 million tons of Pittsburgh-seam coal, ample reserves for the next 40 yr are assured, the company reports. Operation will be based on all trackless mechanical mining, with 10-ton mine cars feeding a 48-in raw-coal slope belt to the new plant. As the underground workings expand, additional producing units will be transferred to the new area and when the new plant is completed more coal producing sections will be opened to fully utilize the new facilities.

Purchase of the Rail & River Coal Co. by the North American Coal corp., Cleveland, was announced Sept. 18 by Henry G. Schmidt, North American president, effective Nov. 30. Acquisition of the property from the Canadian National Ry. for an undisclosed sum will boost North American's coal production to more than 6,000,000 tons annually, making the company one of the 10 largest commercial producers in the U. S., Mr. Schmidt pointed out.

Rail & River's Mine No. 3, located at Dilles Bottom, Ohio, contiguous to the Ohio River and some 20 mi downstream from Wheeling, is fully mechanized, with modern and efficient mining equipment. The property contains proven reserves of more than 100 million tons of Pittsburgh No. 8 coal. Included in the sale is some 30,000 acres of coal land and more than 100 acres of surface property. Beginning Dec. 1, a substantial tonnage will be shipped by barge to the R. E. Burger plant of the Ohio Edison Co. 1½ mi away under a long-term contract, with the remaining output sold in the commercial market, Mr. Schmidt said.

Operation of the No. 3 mine will be continued as in the past under the management of E. F. Maurer, with the existing organization maintained in substantially its present form, Mr. Schmidt indicated. The mine is contiguous to North American's Powhatan Mines Nos. 1 and 2, also on the Ohio River, and will be known as Powhatan No. 3 mine. Rail and River's office at Bellaire, Ohio, also will be continued.

More than 1,950 ft of a 2,000-ft haulageway under construction at the Sunnyside No. 1 mine of the Kaiser Steel Corp., Carbon County, Utah, had been driven early last month, it was reported. A part of a $440,000 expansion program, the new tunnel being driven through rock is to be completed by Jan. 1 and is expected to increase the mine's haulage capacity by some 2,500 tons daily, eliminating use of the present outside slope hoist. The company's expansion pro-

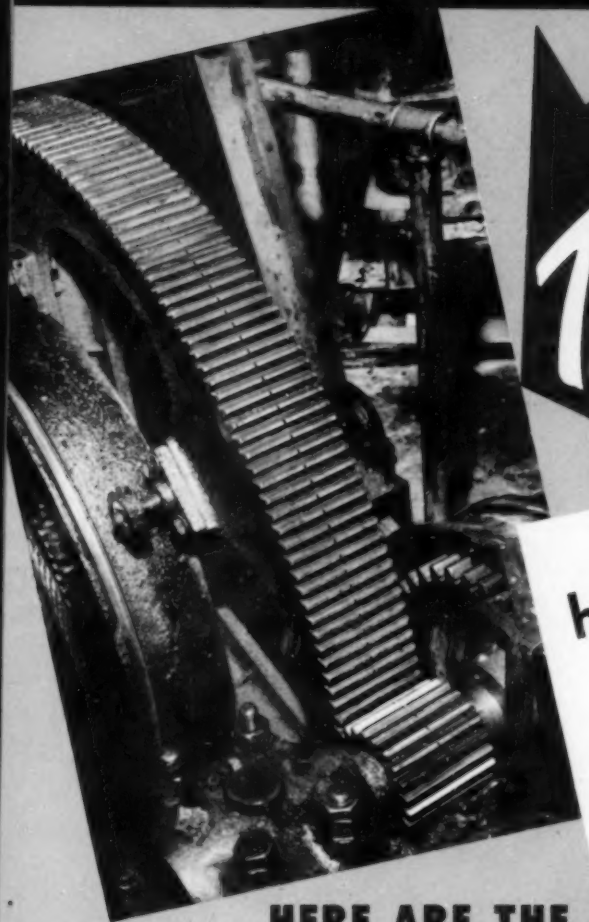
COAL MEN ON THE JOB

CUMBERLAND VALLEY MINING INSTITUTE—Spencer Bowman, Mining Development Committee, BCR, talks to institute members in Middlesboro, Ky. Others shown are: Joseph Moody (left), Southern Coal Producers' Association; Robert Nichols, Black Star Coal Corp., new institute president; C. B. Burchfield, past president; and Ira Inman, institute secretary and safety director.

More "Coal Men" Photos Appear on Pages Following

at the CARBON FUEL COMPANY

CARBON, WEST VIRGINIA



Protective cover removed to show "Tool Steel" Drum Gear and Pinion.

TOOL STEEL PROCESS

has given 11 years of trouble-free service and is still less than 50% worn!

HERE ARE THE FACTS!

TYPE OF MACHINE: 40 H.P. Man and Supply Hoist.
OPERATION: Hoisting men and supplies. 8 hours per day, 5 days per week.

Service Life:

"TOOL STEEL" Installed July, 1939 and still in service. "Tool Steel's" indicated service life should be at least 22 times that of untreated gears!

COMPETITIVE MATERIAL Cut steel — untreated. 2 gears and 2 pinions completely worn in 2 years. Average life only 1 year per set.

• TOOL STEEL'S EXCLUSIVE GUARANTEE •

All "Tool Steel" Parts Carry a Written Guarantee to Outlast Any Other Products Used in the Same Service!

"Tool Steel's" service life can be equalled by no other products!

"TOOL STEEL" PROCESS

The Standard of Quality

for GEARS • PINIONS • SPROCKETS • WHEELS *and other* HARDENED PRODUCTS

THE TOOL STEEL GEAR & PINION CO.

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Wellman will build it

- Special Cranes
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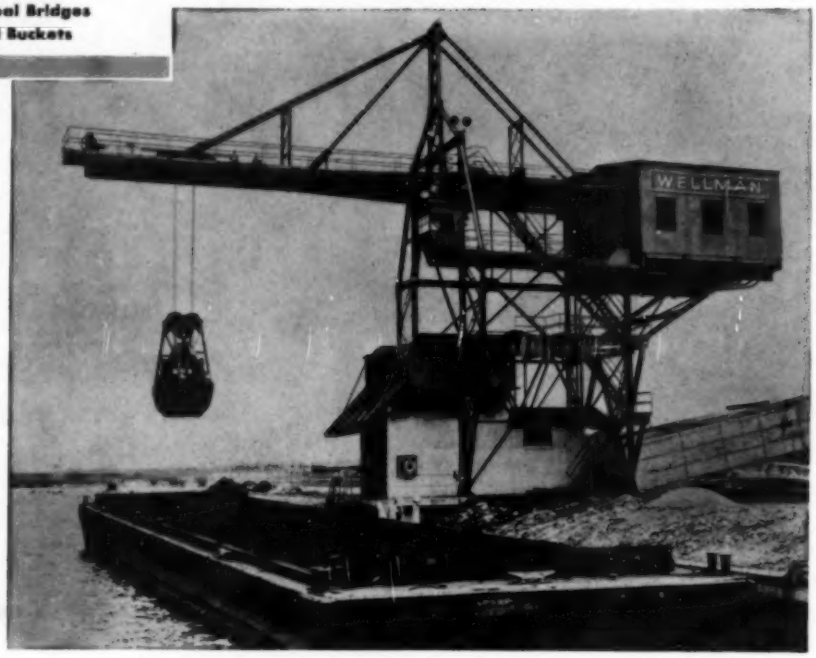
- Car Dumpers
- Gas Flue Systems
- Gas Reversing Valves
- Coke Pushers
- Mine Hoists
- Skip Hoists
- Ore and Coal Bridges
- Clamshell Buckets

→ speed coal handling with

Wellman Tower Unloading Cranes



Wellman Tower Unloading Crane with 6¼ ton "Williams" type Multiple Rope Bucket.

● The Wellman crane shown above provides highly efficient unloading of barges. It is just one of many pieces of modern, dependable equipment designed and built by Wellman to improve your coal handling. Take advantage of Wellman's half century of experience to help speed your operations and cut your costs.

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NO SHAKE-OUT GIANTS NEEDED

PERMATREAT reduces packing and freezing in the car

You prevent damage to rolling stock and eliminate much of your customers' unloading problems when your coals are treated with PERMATREAT Coal Spray.

PERMATREAT Coal Spray reduces segregation and packing around the doors which often requires shaking equipment to dislodge. It coats the coal with a water-repellent film which causes it to dewater faster, both after washing and in transit during wet weather. This is also the best insurance against freezing for dry coal will not freeze.

Ashland PERMATREAT COAL SPRAY seals in dust

Ashland engineers have worked for many years with mine operators to develop the correct procedures for dust-proofing and freeze-proofing all grades of coal. They can prove without a doubt that PERMATREAT coal spray is the most economical and efficient method. Ask our engineers to give you the complete story of PERMATREAT Coal Spray. No obligation—phone or write today.

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Ashland, Kentucky

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- A complete line of simplified, versatile pipe couplings ¾" through 60" sizes for steel, spiral and cast iron pipe ... that automatically provide flexibility for irregular laying contours and yet assure positive-lock, leak-proof joints even under extreme pressure, vacuum or strain conditions.
- A complete line of modern Full-Flow Elbows, Tees and other Fittings that provide for directional changes, branch lines and all of the other essentials of a piping system.
- Handy, portable Vic-Groover Tools that prepare the pipe twice as fast and with half the effort of conventional pipe threader.

On your next piping job — new construction, repairs, or alterations — try the Victaulic Method and you'll be sure to save time, work, and money.

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27TH VICTAULIC YEAR

The easiest way to make ends meet
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PIPE COUPLINGS AND FITTINGS

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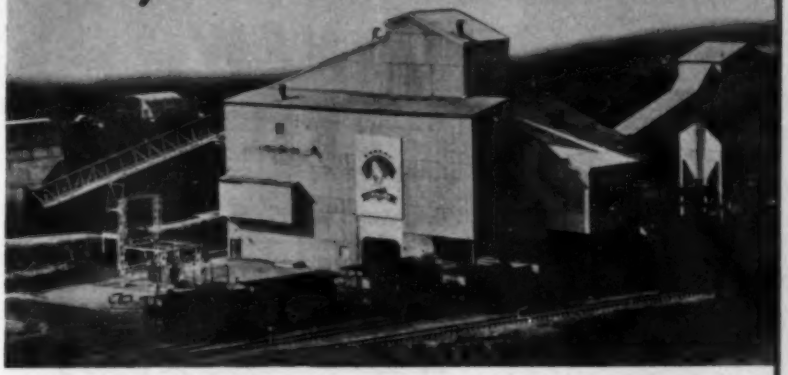
gram also includes construction of 8,900 ft of haulageway underground and improvements in the No. 1 slope.

Paradise Collieries, Inc., a newly formed subsidiary of the West Virginia Coal & Coke Corp., will begin immediate construction of a new strip mine and cleaning plant with an annual capacity of 1,000,000 tons in the Paradise coal field, Muhlenberg County, Kentucky, T. G. Gerow, president of the two companies, announced Sept. 21. The new company, which is expected to be in production by January, 1953, has secured the lease rights and purchased the fee holdings of the Pittsburg & Midway Coal Mining Co. in the field. West Virginia Coal & Coke, holding 51% of the Paradise stock, will provide administrative and executive management for the new operation. The remaining 49% of the stock is held by Shaw & Co., New York. Containing a large reserve of coal, the property is on both the L. & N. R. R. and the Green River. The Pittsburg & Midway Coal Co. of Chicago will act as exclusive sales agents for the mine.

The Buck Run colliery of the Philadelphia & Reading Coal & Iron Co. was scheduled to close permanently Aug. 31, it was reported. While employees had been most cooperative, it was impossible to continue to operate the mine economically and the company had no alternative but to close it down, George A. Roos, vice president, was reported to have announced. P&R took over the property Nov. 20, 1950, after the Buck Run Colliery Co., operators since 1938, closed it.

EVAN EVANS (left), president of the Lehigh Navigation Coal Co. and the Panther Valley Water Co., hands a check to Dennis Gallagher, Lansford, Pa., retired company truck driver, who was named Pennsylvania "Driver of the Month" for June, in competition with others nominated from among the state's 300,000 truck drivers affiliated with Pennsylvania Motor Truck Association. The company's check, which was to cover a trip to Quebec long sought by Mr. Gallagher, was in addition to the gold pin and scroll presented by the trucking association.

BIG RETURNS FROM DAILY 3-SHIFT OPERATION



The Hendrix Mine of Consolidation Coal Company (Ky.) is an excellent example of efficiency for the reason that it is in constant and continuous three-shift operation. This procedure results in high daily shipments with the lowest possible initial expenditure for plant and equipment.

There is a good reason for this efficiency, of course: modern equipment, carefully engineered, plus pushbutton control.

The entire output of this 250 ton per hour plant is washed. Fine sizes are first dewatered in a centrifuge, then thermally dried.

Special features include windowless construction, artificial ventilation and adequate lighting. A plant operating force of only four men per shift is required.

Here, again is an example of the value of Roberts and Schaefer engineering . . . perhaps you have a problem that involves improved preparation and lowered costs. We are ready to serve you. Your inquiries are invited.

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THESE NEW BULLETINS ARE YOURS FOR THE ASKING

Air Washing Coal
This bulletin, No. 175, contains full details about the advantages of air washed coal . . . explains why dry coal has higher B.t.u. . . . how the R. & S. Super Airflow Cleaner separates the dust which may then be recombined with the clean coal or discarded. Detail charts, diagrams and photographs are included.

Wet Washing for Pre-sized Coal
Bulletin No. 176 gives you a comprehensive view of the five basic types of Roberts and Schaefer wet washing machinery. Each has its own particular advantages and applications. Each has its own limitations. Considered together they are capable of meeting any conceivable wet washing requirement. Fully illustrated including diagrams and capacity charts.

The Hardinge Counter-Current Heavy Media Separator
The many advantages that accrue from the use of this modern equipment are discussed in detail in this bulletin, No. 177. Photographs and diagrams show the operating principles and construction features.

Write for any or all of these informative bulletins.

ROBERTS AND SCHAEFER COMPANY
130 North Wells Street,
Chicago 6, Illinois.

PARIS MANUFACTURING COMPANY

Announces THREE *NEW* DRILLS

The PARMANCO Coal Drill will drill 2¼ inch holes at a speed of up to six feet per minute in #5 coal. Equipped with heavy duty truck-type transmission and rear end and a complete hydraulic feed, the drill is operated by one man from the control seat. It is made in two sizes with a 12 h.p. or 25 h.p. gas motor and all units are completely self-contained and enclosed in oil-tight cases.

ALREADY USED by

Big Sand Collieries, Inc.	Knox Coal Co.
United Electric Coal Co.	Southwestern Ill. Coal Co.
Fairview Collieries Corp.	Trent-Trent Coal Company
Celestial Coal Co.	Subsurface Field
Little Minor Coal Co.	Harbison-Walker Refractories Co.
Nemo-Hinsley Coal Mining Co.	Mexico Refractories Co.
Sherwood-Templeton Coal Co.	A. P. Green Fire Brick Co.

THIS UNIT IS DELIVERING 6-INCH SHOT HOLES — READY FOR LOADING at Better Than Two Feet a Minute ! ! !

The new PARMANCO Hi-Speed Horizontal Drill is completely redesigned around a 40 h.p. engine with four drilling speeds which, in field tests, has cut one-third off the footage drilling time —a cost-per-drilling-foot saving that we are passing on to the strip mine operator and contractor at no increase in our price. In addition the drill is equipped with a starter and generator, dual type front wheels, truck type rear axle with mechanical brakes and a traction drive with both forward and reverse.

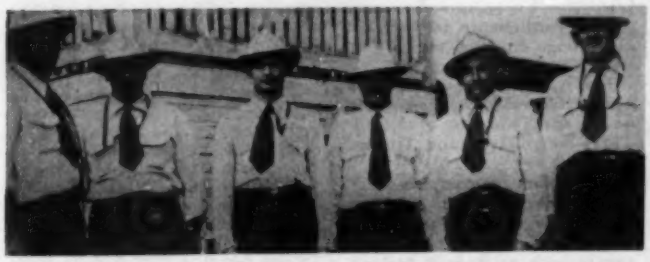
PARIS MANUFACTURING COMPANY

Paris, Illinois

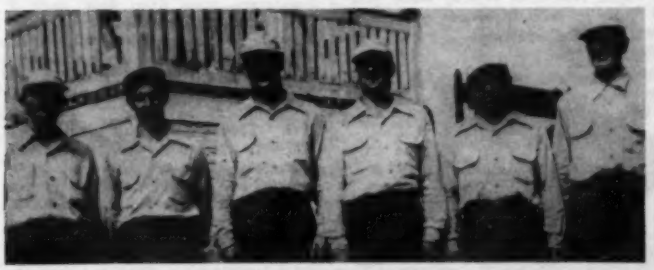
Ranking First Aid Teams in Meet Sponsored by the North Central District Safety Association, Indiana, Pa.

FIRST—IMPERIAL COAL CO., NO. 2 MINE: Ralph Davis (left), captain; John Torok, John Pabrazinsky, John Dixon, Victor Rangh, John Simon and Nick Martick.

SECOND—ROCHESTER & PITTSBURGH COAL CO., KENT NO. 2 MINE: W. W. Thompson, captain; Henry Salva, Mike Savage, Henry Turnbull, Gordon Windows, Charles Lucas and William Zagrodnichek.



THIRD—ROCHESTER & PITTSBURGH COAL CO., KENT NO. 1 MINE: Joseph Balazs, captain; Joe Roschella, Michael Kalafsky, Paul Sutton, Emery Prokay, Mike Wasylyshyn and H. R. Ghezzis (not shown).



FOURTH—ROCHESTER & PITTSBURGH COAL CO., ERNEST MINE: George Mihelic, captain; Don Sheasley, Tom Larsen, Edward Bernard, Mike Klyap and Evan Reese.

Actual mine installations of Johnsonite Plastic Pipe prove its resistance to corrosion is many times greater than ordinary pipe.

Also, installation costs are lower because it handles so easily and the number of couplings have been reduced.

500 feet in the ½" size weighs only 50 lbs.

It finds its own floor—just lay it down

It's so flexible it can be tied in a knot

It can be cut with a knife

Johnsonite is tough. It lasts over 30 years.

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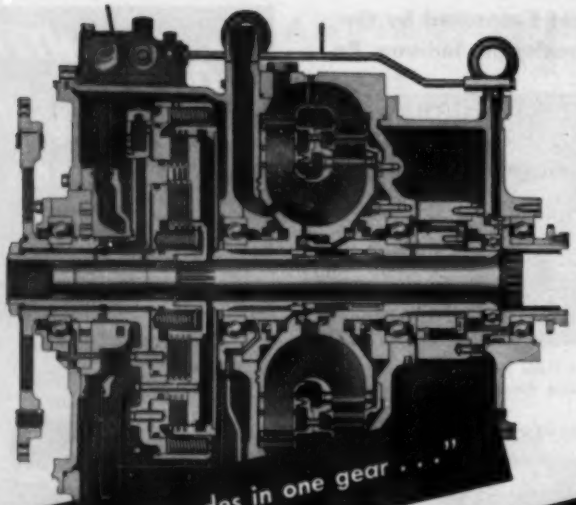

"Takes 13% grades in one gear . . ."

"Absorbs 90% of the braking load . . ."

"Substantial savings on axles, tires and brakes . . ."

Model DF

Twin Disc Hydraulic Torque Converter

"Field reports of the Twin Disc Three-Stage Hydraulic Torque Converter with Direct Drive feature, in big heavy-duty trucks, are proving that 99% of forward gear shifting can be eliminated in off-highway operation. Extensive tests on the Mesabi Iron Range in this Twin Disc equipped Dart truck indicate that these converters can significantly reduce time on hauling cycles on this, probably the world's toughest trucking, with loads up to 30 tons and grades up to 13%. Furthermore, very *substantial* savings on axles, tires, gears and brakes are reported."

That is the first paragraph from a just-published four-page bulletin on the *new* Twin Disc Model DF Three-Stage Hydraulic Torque Converter.

You'll want the complete story because never before have so extensive tests been reported on three-stage hydraulic torque converters with an *in-built* braking feature which no other torque converter can claim. Write today, and be sure to ask specifically for Bulletin No. 162. It may show you how to save thousands of dollars in truck operation.

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COMING MEETINGS

Thirty-ninth National Safety Congress and Exposition: Oct. 8-12, Stevens, Palmer House, Congress and Morrison Hotels, Chicago, Ill.

Joint Fuels Conference, AIME Coal Division and ASME Fuel Section: Oct. 11-12, Hotel Roanoke, Roanoke, Va.

Illinois Mining Institute: annual meeting, Nov. 2, Hotel Abraham Lincoln, Springfield, Ill.

West Virginia Coal Mining Institute: fall meeting, Nov. 9-10, Summit Hotel, Uniontown, Pa.

Kentucky Mining Institute: annual meeting, Nov. 15-16, Lexington, Ky.

Pocahontas Electrical & Mechanical Institute: Nov. 26, Bluefield, W. Va.

UMWA Sues Companies and Law Officials in Ky. Drive

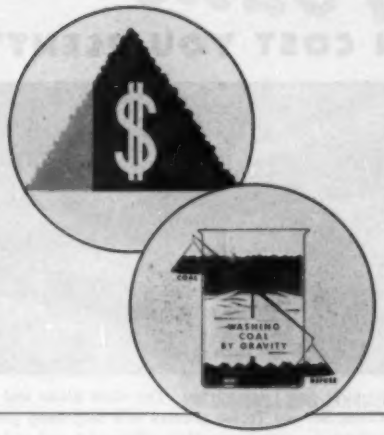
The UMWA took a new tack last month in its Kentucky organizing drive when it filed suit Sept. 11 in a Lexington, Ky., federal court for $2,000,000 in damages for interference with the right to organize and assemble peacefully. A total of 612 defendants were named in the suit, including coal companies, judges, sheriffs and other law officers in Clay and Leslie Counties.

The suit cites violence and disorder resulting from the union's attempt to organize some 3,000 non-union miners in the area and charges law officers with being in the pay of the companies and with having falsely imprisoned union sympathizers and conspiring to deprive them of their civil rights. It also asks for an injunction to prevent recurrence of the alleged interference.

Meanwhile, the UMWA intensified its organizing drive in several other areas. In Wellston, Ohio, a large group of union men visited the newly opened Broken Aro strip mine Aug. 20, pushing trucks over an embankment and causing other damage to the plant and equipment estimated at a total of $6,000, it was reported. Two UMWA organizers were fined $500 each 2 days later for contempt of court in violating a court order calling for orderly picketing, and while some 300 miners demonstrated Aug. 28 no further disturbances were immediately reported.

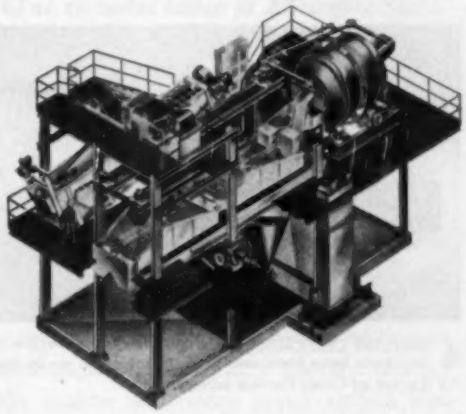
In Central Pennsylvania, the UMWA organizing drive went into high gear at the end of August, with Michael F. Widman, one of the union's top organizers reportedly in command. Locals in the area have passed resolutions compelling members to do picket duty when ordered and several deep mines reportedly were unable to operate on occasion in early September because of miners' absence.

CONTROLLED CLEANING produces COAL PROFITS



Profitable coal cleaning in today's market requires control of washing operations with low cost, efficient methods.

The newest, most efficient coal cleaning method for most operations is Heavy-Media Separation with WEMCO MOBIL-MILLS.



You have a choice of three types of Mobil-Mills in selecting a washing plant to fit your particular requirements:

1. **DRUM TYPE MOBIL-MILL** for accurately controlled washing of a full range of sizes from 8" to ¼" with capacities up to 420 TPH.
2. **DOUBLE DRUM TYPE MOBIL-MILL** for efficient cleaning of coal having complicated middling and washing characteristics. Produces a high quality float coal, a carefully controlled float middling and a reject. Capacities dependent on individual problem.
3. **CONE TYPE MOBIL-MILL** for efficient, large volume production of fine coal in sizes 4" to 3/8", with capacities up to 420 TPH.

Prime advantages of WEMCO MOBIL-MILLS for coal cleaning are:

Efficiency of cleaning
Accurate control of operations
Low investment per TPH of washed coal
Low operating and maintenance costs

Call a WEMCO engineer today for complete information on WEMCO test facilities to solve your coal cleaning problems, or write for descriptive bulletin.

OTHER WEMCO PRODUCTS

Mobil-Mills • Coal Spirals • HMS Thickeners
HMS Pumps • Densifiers • Cone Separators
Drum Separators • Fagergren Laboratory Units
Fagergren & Steffensen Flotation Machines
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Dewatering Spirals • Agitators • S-H Classifiers
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2 JOURNAL BOX LUBRICATION. The right grade and type of Cities Service Trojan greases will help keep your mine equipment operating smoothly, efficiently, and at less cost.

3 POWER SHOVEL LUBRICATION. Specific grades of Trojan greases recommended by Cities Service are daily prolonging life and efficiency of strip mining machinery.

4 CONVEYOR LUBRICATION. Critical conveyor lubrication problems have been satisfactorily solved in many cases by the use of Cities Service lubricants.

A COMPLETE NEW LINE OF MECHANIZED MINING LUBRICANTS

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Including:

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Please send me without obligation your new booklet entitled "Coal Mining Machinery Lubrication."

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QUALITY PETROLEUM PRODUCTS

Not, PLEASE, In the Name of Fairness

Our national Office of Economic Stabilization has adopted a policy of gearing wages to the cost of living. We are told that "escalator clauses," which provide that rates of pay shall be adjusted to take account of changes in the cost of living, will be generally approved.

If the adoption of this policy had been announced as a frank concession to political expediency, it would have been quite understandable. There may very well be votes, lots of them, in a policy which purports to protect the income of a large group against loss through the price inflation caused by the defense program.

A case might even have been made for a policy of approving escalator clauses on grounds of production expediency. The leaders of some three million organized workers now covered by such clauses have indicated that they would fight to the limit to keep them and thus maintain "real wages," that is, wages measured by their purchasing power. The leaders of other organized groups have indicated they would fight to get the benefit of such clauses. Denial of them might mean serious strikes.

Justified "In Fairness"

However, the policy of approving escalator clauses was not based on these relatively low grounds of expediency. It was justified on high moral grounds, on grounds of "fairness." In the words of the President's Council of Economic Advisers, "maintenance of real wages during inflation cannot in fairness be disallowed."

That proposition is false.

It would be truthful to say, "maintenance of real wages during inflation cannot in fairness be allowed."

The truth of the corrected proposition becomes evident immediately when you take a look at the basic nature of the inflationary problem created by defense mobilization.

We are devoting a large share of our national production to defense. The share is now scheduled to hit about 20% in 1952.

Since we are not able to increase our total production fast enough to meet defense needs

in addition to civilian needs, that means a cut in the supply of goods and services that is available for civilian consumption. But the money paid out for the production of defense materials is added to that which is available to buy civilian goods.

Thus, more money is put into the hands of the people to buy less goods. So prices go up. That is inflation.

If one group of people then is granted enough additional money to offset the price increases — and that is the purpose of an escalator clause — and thus can continue to buy as much as they have been buying right along, less goods will be left for other consumers who are not getting this advantage. That is palpably an unfair distribution of the sacrifices necessitated by defense mobilization. In fairness, therefore, maintenance of real wages in inflation cannot be allowed.

Organized workers were not the first, of course, to get the benefit of an automatic adjustment to take account of the increased cost of living. The farmers got theirs first. The price parity formula is, in essence, an escalator clause. The federal government underwrites increases in the prices of the things farmers sell in order to match increases in the prices of the things they buy.

Crucifying the Helpless

As matters stand, two groups are without benefit of escalator clauses. One group is composed of manufacturing firms. While they have not been nearly as successful as the misleading reports of "record-breaking profits" suggest, they have been able to look after themselves fairly well — thus far.

But one group is completely without protection. It is that numerically large but politically unorganized mass of people — many of them old and relatively helpless — who are trying to live on pensions, annuities and other fixed incomes derived from their savings. They are at the end of the line when the increased costs of inflation are passed along. They have no one to whom they can pass the buck. They are being progressively pauperized by the continuing inflation caused by progressive boosting of costs and hence prices.

With the present line-up of pressure groups in Washington, protection for the principal victims of inflation — those who have saved for a rainy day only to find inflation has blown away the roof — is obviously an extremely difficult business. But to have even temporary insulation against inflation granted to powerful groups in the name of fairness should be offensive to the nostrils of a nation that presumes to assert the moral leadership of the Western World.

The only really fair way to handle inflation is to prevent it. But once it is under way, fairness demands that the burdens be as evenly distributed as practicable.

An escalator clause — or a farm parity provision — is explicitly a device to enable the group favored by it to escape the burden of inflation. Whatever concessions we feel we must make to political pressures or production expediency, let us at least be honest enough not to invoke "fairness" as justification for so arbitrary a discrimination in the distribution of the defense burden.

McGraw-Hill Publishing Co., Inc.

Regional First-Aid Winners Eligible for National Meet

1951 ANTHRACITE FIRST AID CHAMPION TEAM is this group from the Hazleton Shaft (inside) colliery of the Lehigh Valley Coal Co. Team members are: Joseph Chernyock, captain, Richard Billig, Carmen J. Garzio, Joseph J. Antanovich, August Cherill, Joseph R. Dziak and James Malto.

ENTRIES for the National First Aid and Mine Rescue Contest at Columbus, Ohio, were chosen at regional "semi-finals" during late August and early September. Contests at Pikeville, Ky., Dallas, Pa., and Ebensburg, Pa., produced winners as follows:

Eastern Kentucky

In a two-day meet at Pikeville, August 31 and Sept. 1, both the first-aid and mine-rescue contests ended in stalemates which could not be broken because torrential rains prevented continuation. Therefore, it was agreed that standings in the National meet would be used to determine regional winners. In the first-aid portion of the 2-day program, which was sponsored by the Big Sandy-Elkhorn Coal Mining Institute, top honors were shared by teams representing Hendrix mine and Mine 214, Consolidation Coal Co. (Ky.), and the Clear Branch Mining Co., Ligon, Ky. Mine 204, Consol (Ky.), National Champion for 1950, was fourth, and Jackhorn mine, Elk Horn Coal Corp., was fifth. Winners in the colored division were Mine 204, Consol, first, Inland Steel Co., second, and Consol's Mine 214, third.

In the mine-rescue competition, teams representing the Inland Steel Co., Wheelright, Ky., and Mine 204, Consol (Ky.), were tied for first place in the self-contained-apparatus division. Princess Elkhorn Coal Co.'s team won in the all-service gas-mask division.

Pennsylvania Bituminous

In a 33-team contest at Ebensburg, Sept. 8, top laurels were won by Team No. 1 of Indianola mine, Republic Steel Corp., Indianola, captained by Vince Stanek. Teams in the runner-up positions represented Melcroft mine, Eastern Gas & Fuel Associates, second; Westland mine, Pittsburgh Coal Co., third; and Robena mine, U. S. Steel Co., fourth. The Indianola team

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Johnstown Coal Solves Dilemma With More W. Va. Scholarships

WHEN IT CAME to awarding its annual scholarship to the Mining School of West Virginia University, the Johnstown Coal & Coke Co., Johnstown, Pa., found itself with a problem. The close scores of the three top candidates in the competitive examination conducted by the University staff made it almost impossible to select just one. So after a great deal of consideration by the committee and interviews with the boys, the company decided to do a most unusual thing and grant scholarships to all three. Receiving the awards were Hillary Burke (left), a graduate of Crichton (W. Va.) High School; William Husk, of Richmond (W. Va.) High School; and James McMillion, Nicholas County High School, Summersville, W. Va. The unusual qualifications of the successful candidates is indicated by the fact that only one boy had a grade of less than a B throughout 4 yr of high school.

won a $350 cash award, the MSA trophy, sterling silver rings awarded by the National Coal Association and safety lamps awarded by the Pennsylvania Department of Mines. The 9th annual contest, which was held at the Ebensburg Fair Grounds as a feature of the Cambria County Fair, was sponsored by the Pennsylvania Department of Mines in cooperation with the UMWA, Pennsylvania Bituminous Coal Operators and the USBM. Dennis J. Keenan, general superintendent, Sterling Coal Co., Elmora, Pa., was general chairman.

Pennsylvania Anthracite

On Sept. 8 at Irem Temple, Dallas, Pa., top honors in the 7th annual Anthracite First-Aid Contest were won by the team representing Hazleton Shaft (Inside), Lehigh Valley Coal Co., Hazleton, Pa., headed by Joseph Chernyok, captain. Other winning teams were as follows: Hazleton Shaft (Outside), second; Maple Hill Colliery, Philadelphia & Reading Coal & Iron Co., Shenandoah, Pa., third; Locust Summit Breaker, P&R, Locust

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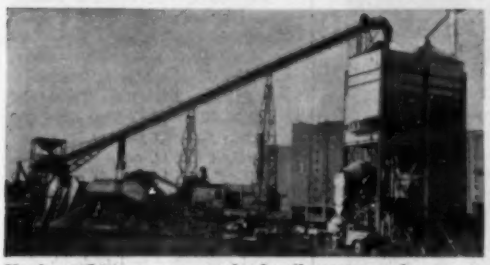

Here's a 30" Pioneer conveyor that handles 1500 tons of aggregate a day for feeding the world's largest tilting concrete mixer. The 183-foot system has Timken® bearings in the idlers.

This Rex conveyor, built by Chain Belt Company, moves 300 tons of coal an hour on Timken bearings. Installed in 1949, the system has approximately 2700' centers with a 643' lift.

AND TIMKEN AGAIN!

Built by Link-Belt Company, this 900-ft. system conveys raw coal and mine refuse at a rate of 550 tons per hour with Timken bearing-equipped idlers.

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6 **MAINTENANCE REDUCED.** Long life and dependable performance of Timken tapered roller bearings cut maintenance to a minimum.

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EQUIPMENT APPROVALS

Six approvals of permissible equipment were issued by the U. S. Bureau of Mines in August, as follows:

Jeffrey Mfg. Co. — Type 35-8BT shortwall mining machine; 50-hp motor, 500 v, AC; Approval 2-803A; Aug. 6.

Crouse-Hinds Co. — Type GUB splice boxes for various size cables; Approval 2-804; Aug. 9.

American Mine Door Co.—Model LC Rockduster; one 5-hp motor, 230 v, DC; Approval 2-805; Aug. 9.

Albert & J. M. Anderson Mfg. Co. —Distribution box; single outlet, 250 v, DC; Approval 2-806; Aug. 14.

Albert & J. M. Anderson Mfg. Co. —Distribution box; three units, 250 v. DC; Approval 2-807; Aug. 30.

Koehler Mfg. Co. — Model 271 Handlamp; Approval 1205; Aug. 2.

Summit, Pa., fourth, and Bliss Colliery, Glen Alden Coal Co., Nanticoke, Pa., fifth. General chairman in charge of arrangements for the 20-team contest was Andrew Wilson, state mine inspector, Pittston.

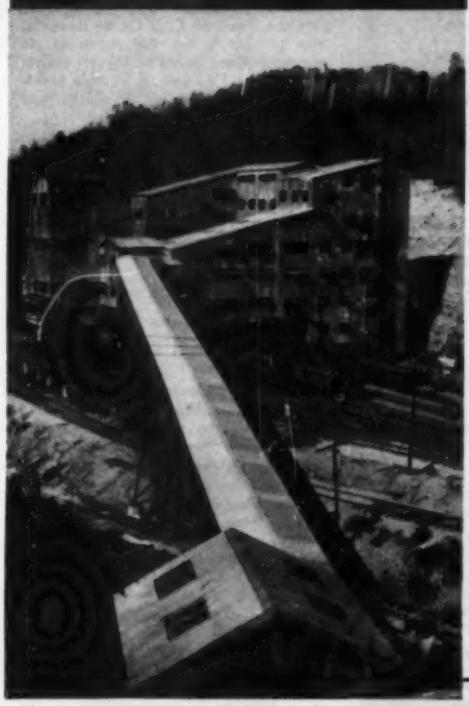
An added feature was the presentation of a Medal of Honor to Walter Legins by M. J. Ankenny, chief, coal mine inspection branch, USBM, in behalf of the Joseph A. Holmes Safety Association, for heroism in rescuing a fellow-worker who was trapped in a shaft.

Personal Notes

M. H. Detweiler, Zeigler, Ill., announced Sept. 1 his retirement as vice president of the Zeigler Coal & Coke Co. after 28 yr of service. Mr. Detweiler first became identified with the coal industry in 1909 when he joined the Madison Coal Corp. Later he resumed his education and was graduated from the School of Mines, Rolla, Mo., in 1911. For the next 6 yr he was associated with a Utah mining company as an engineer and mine manager and joined Zeigler Coal & Coke in 1923. Active in many school and community affairs, Mr. Detweiler also is a former Rotary district governor and has a 26-yr record of perfect Rotary attendance. Beyond wintering in Florida, Mr. Detweiler has made no plans for the future.

Joseph J. Yuhas, formerly general manager, has been named vice president of operations of the Somerset Coal Corp., Somerset County, Pennsylvania.

Carl Burgner has resigned as assistant division superintendent, Peabody Coal Co., Marion, Ill., to become active in the Marion City Dairy, in which he recently acquired an interest. **Gordon Fuller** has been appointed to succeed Mr. Burgner as assistant



92,185,000 TONS OF METALLURGICAL COAL USED IN 1949

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Takes its suction from drive side only!

If the newest Morris Type R Slurry Pump had no other feature but this one . . . it still would be the most outstanding pump on the market.

Since the packing is under suction or positive head pressures only, it is not subject to the high stuffing box pressures typical of conventional pumps. Therefore, it is not vulnerable to severe wear and tear of abrasive solids. Packing troubles are at an absolute minimum. But this is just one of many Morris features which mean . . .

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- Easily dismantled — Impeller and shaft sleeve can be renewed without disturbing suction and discharge piping or bearings.
- Simple in design — The Morris Slurry Pump has no internal studs and bolts . . . no troublesome joints and fits.
- Interchangeable shell — Suction and discharge nozzle can be swiveled to almost any position. Shell changed for either right or left hand rotation.
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Easy to Install! Easy to dismantle! Easy to maintain!

The Morris Type R is specifically engineered to handle mixtures containing ore concentrates . . . tailings, slag, and residue from filters and classifiers. Operates on all types of caustic or acid mixtures containing abrasives or solids.

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division superintendent, in addition to his duties as division chief electrician.

C. W. Imlay, for the last 6 yr superintendent of the Bevier mine of the Bevier Coal Co., Macon, Mo., has been appointed superintendent of the Key Coal Co., Astoria, Ill. Both companies are subsidiaries of the Sinclair Coal Co..

Oscar J. Leach has been named general manager of the Wellston Coal Co., Wellston, Ohio.

Dr. G. R. Fitterer, professor and head of the department of metallurgical engineering since 1939, has been appointed dean of the Schools of Engineering and Mines at the University of Pittsburgh. A graduate of Rose Polytechnic Institute, Dr. Fitterer also holds degrees from Carnegie Institute of Technology and University of Pittsburgh. For several years he headed the metallurgy department of the Pittsburgh station of the USBM and is widely known throughout industry for his research and activities in the field.

James L. Dove has resigned as slate foreman at Kopperston No. 2 mine, EG&FA Coal Div., to become mine foreman, Clean Eagle mine, Clean Eagle Coal Co., Mallory, W. Va.

O. Greesens has resigned as vice president and comptroller of the Commonwealth Edison Co., Chicago, to join the Peabody Coal Co. as financial vice president. He will serve as an accounting and financial officer, assisting Charles S. Ellis, senior vice president, who celebrated his 50th year with the company last year.

Obituaries

James P. Collins, general manager of Ohio mines for the Warner Collieries Co., Cadiz, Ohio, died Aug. 18 in the Martins Ferry hospital, following an illness of 3 wk.

Henry S. Richards, 55, director of safety, Blue Diamond Coal Co., Knoxville, Tenn., died Aug. 23 in Fort Sanders hospital following an extended illness. Formerly a member of the board of directors, Mr. Richards had been associated with Blue Diamond since it was founded in 1915.

Charles A. Muse, 84, a vice president and partner of the Crown Coal & Coke Co., Pittsburgh, died Aug. 27 at his home in Ben Avon. For many years before his retirement in 1932 Mr. Muse was an official of the H. C. Frick Coke Co.

George J. Wheeler, Sr., 85, mine superintendent for the Valley Camp Coal Co. for 25 yr before his retirement, died Sept. 12 in Cambridge, Ohio, where he had lived for the last 6 yr.

A. H. McIntire and his wife, of Mt. Hope, W. Va., were killed Sept. 19 in an automobile accident near Garrison, Ky. Mr. McIntire had served as secretary-treasurer of The New River Co. since 1918.

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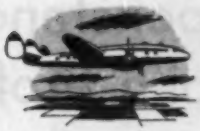
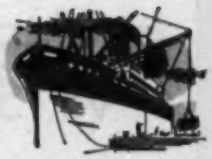


For Aircraft



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BULLETIN 5025 gives information on "How to order Wire Rope" and lists all sizes and constructions of Improved Plow Steel Monarch Whyte Strand Wire Rope. Copy sent on request.

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The SuperDuty Diagonal Deck Coal Washing Table stands at the forefront of equipment designed to recover fine sizes profitably. It has been a part, singly or in batteries, of every important installation in the past six years. There are sound engineering reasons why the SuperDuty has won this acceptance.

Recognition of these facts is meeting the yardstick of "solid profits" for operators, large and small. Ample evidence is available. Ask for Bulletin 119.

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Association Activities

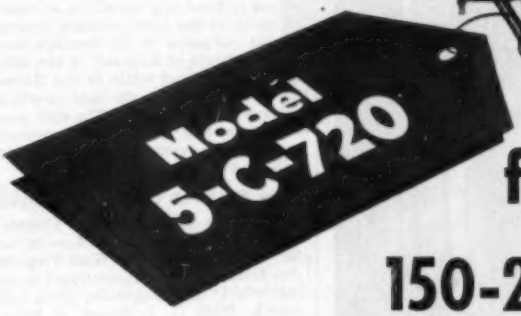
West Virginia Coal Association has named as secretary Carl Andrews, former mayor of Charleston, W. Va. Mr. Andrews succeeds J. V. Sullivan, who retired after 30 yr of service.

The Property Owners' Committee has appointed William M. Maddox executive secretary, with offices at 200 Edmonds Bldg., Washington, D. C., it was recently announced by R. D. Stockdale, chairman of the committee. Mr. Maddox, who is an attorney and former associate of Roy Carson, traffic manager of the Harlan, Hazard and Southern Appalachian Coal Operators' Associations, succeeds Charles E. Bell, who is being retained by the committee as a special consultant.

Pittsburgh Coal Scholarships

SCHOLARSHIPS IN MINING ENGINEERING awarded annually by the Pittsburgh Coal Co., Div. of Pittsburgh Consolidation Coal Co., were won this year by Carl Schrock (top), of Gray, Pa., and Walter Jaap Jr., of Cannonsburg, Pa. Mr. Jaap is a graduate of Chartiers High School and has enrolled in the mining course at Pitt. Mr. Schrock is a third-year student in the mining school at Penn State.

Just the Ticket-



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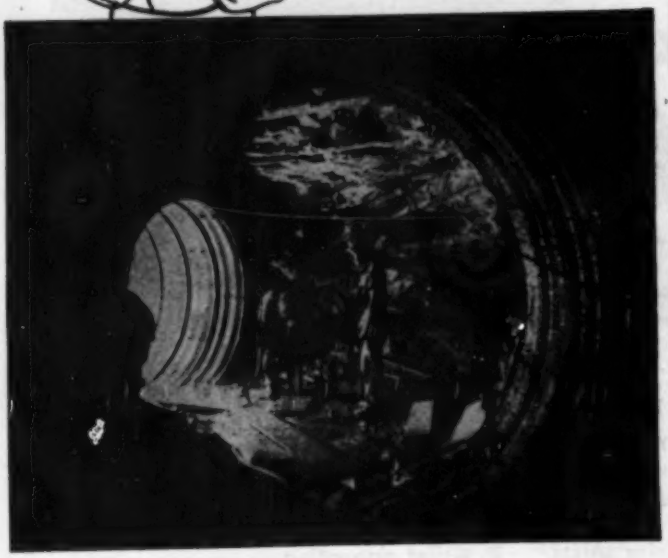

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ARMCO LINER PLATES

News Briefs . . . From p 129

payment of their lost wages of practically a year. The transfer had been fought by the 214 local even though Mine 207 was working out and transfers of entire crews between the interconnected mines had been the rule for years. The hearing was to be resumed Sept. 14 for the testimony of one witness who was not previously available.

Coal Depletion Rate Boosted

The Senate Finance Committee, working on the forthcoming tax bill, approved Sept. 5 an increase in the depletion allowance for coal to 10%, as provided in the bill already passed by the House. The rate under the present law is 5%. The committee also accepted a House provision designed to treat coal royalities as capital gains rather than ordinary income for tax purposes. In the Senate's version the "date of disposal" is the date the coal is mined while in the House bill it was defined as the date on which a lease is entered into. The new provision on coal royalties is expected to cost the government about $10 million yearly in reduced taxes.

New ME-MMA Group Organized

A branch of the Mining Electro-Mechanical Maintenance Association for Ohio and Northern West Virginia was formed at an organizational meeting held in St. Clairsville, Ohio, last month. With D. J. Baker, of Pittsburgh, national president, presiding, the following officers were elected: president, Neal Thompson, Valley Camp Coal Co.; vice president, Emerson Hutmire, Columbia Coal Div.; secretary-treasurer, E. E. Gaston, Hanna Coal Co.; chairman, membership committee, A. M. Newcombe, Valley Camp Coal Co.; program chairman, W. E. Corbett, Saginaw Dock & Terminal Co.; and branch representative, S. H. Reppert, Cambria Mining Co. Organized for discussion of electrical and mechanical mining problems, the group will hold meetings the second Monday of each month in the St. Clairsville municipal building.

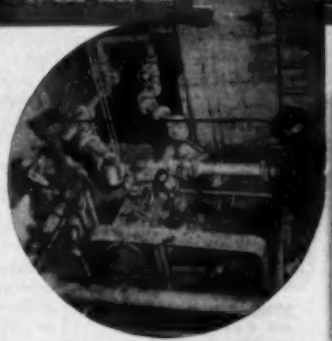
Imperial Awards Scholarship

The $500 annual scholarship offered by the Imperial Coal Corp. to employees or their sons for study of mining engineering at Pennsylvania State College has been awarded to James P. Reilly Jr., of Coalport, Pa., George E. Owen, company president, announced last month. Mr. Reilly is the son of James P. Reilly, assistant mine foreman at the Moshannon No. 1 mine, who has been employed at the company's Coalport operations since 1933. The 1951 award is the third successive scholarship the company has provided. The two prior recipients are entering their junior and sophomore years this fall under provisions of the grants.

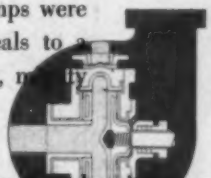
SLUDGE that chews the heart out of most pumps

View of plant and pipelines from top of 320-foot hill.

Next to diamond dust, the abrasive diet of the Hydroseals at this grinding and polishing plant is about the worst that you can imagine for slurry pumps. Every day hundreds of tons of sludge, consisting of emery dust, powdered glass, fine silica sand, and other harsh abrasives, go into their innards. In addition, to push this material through more than a mile of pipe from the plant to the settling basin, they have to overcome a clearwater head of *540 feet*. The sludge is thick, containing about 33% solids, and is handled at the rate of 230 G.P.M. In spite of the tough operating conditions, no special maintenance has been necessary since the pumps were installed in 1946. It would be difficult to put Hydroseals to a better test and, according to the engineers at the plant, [illegible] hard to find better pumps.



One of the B-Frame Hydroseal Slurry Pumps in the main pump house.



For details on all Hydroseals, **write for Catalog 451.**

If you're planning to move anything from emery dust to gravel, we'd like to tell you the advantages of Hydroseal pumping. Our recommendations will be made without obligating you in any way.

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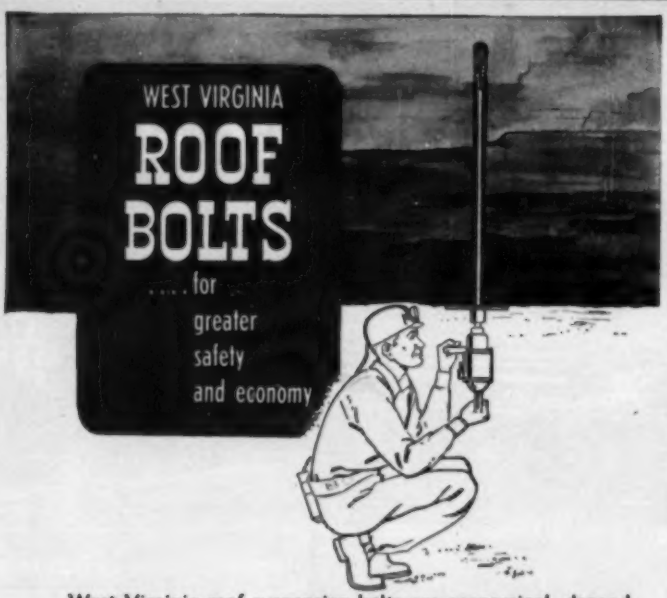
MAXIMIX RUBBER PROTECTED

HYDROSEAL PACKLESS AND MAXIMIX DESIGNS ARE COVERED BY PATENTS AND APPLICATIONS IN THE MAJOR MINING CENTERS OF THE WORLD

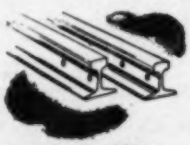


West Virginia roof suspension bolts are economical, dependable and convenient. By rigidly supporting the roof without timbering, roof bolts leave the passageway clear for the full speed operation of loading machines, efficient and fast laying of track, and the fast unhampered operation of cars and motors. West Virginia roof bolts can be used singly at selected points or in sets of three or four with steel channel. Available in lengths from 2 to 6 feet. Write for illustrated descriptive circular.

STEEL TIES — Standard designs and weights. Save labor, save height, make good track.

NOTICE

Due to material shortages and present heavy demand, prompt delivery is not always possible.



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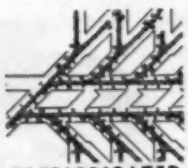

PREFABRICATED TRACK—Made to exact specifications for easy handling, easy installation at substantial savings.

TURNOUTS — Economical in use, economical in cost, easy to install and maintain.

Coal Lessors Expected to Protect Welfare Fund Payments

Old line anthracite producing companies must help safeguard payments to the Anthracite Health and Welfare Fund due from independent operators who lease their coal lands, Thomas Kennedy, UMWA international vice president, told delegates at the District 1 convention Sept. 18. "Something will be done to protect the payments" at the next joint conference of operators and mineworkers, he reported. In his 45-min talk, Mr. Kennedy also said that the anthracite industry is competitively over its worst days and is well on its way to stability.

Highwall Mining Requires Permit in Pennsylvania

In a letter to mine inspectors, Richard Maize, Pennsylvania Secretary of Mines, warned last month that there were many deep mines operating in the highwalls of strip-mines without permission of the Department, which is a violation of the law. The same ruling will apply to any operator who is auger-mining in a highwall, Mr. Maize said, even though whether auger mining is deep or strip mining is still questionable. The department is currently developing rules to regulate auger mining, he reported.

Machinery Committee Meets

The newly created Mining Machinery Industrial Advisory Committee held its first meeting with officials of the National Production Authority Sept 11. Created by the NPA to discuss priority and allocation problems of mining machinery manufacturers, the group told the NPA that the inability to secure steel and copper was jeopardizing the nation's production and processing of scarce metals and minerals. Industry members of the new committee include: J. H. Fulford, Jeffrey Mfg. Co.; J. D. A. Morrow, Joy Mfg. Co.; R. A. Manegold, Dings Magnetic Separator Co.; John P. Courtright, Marion Power Shovel Co.; William Whaley, Myers-Whaley Co.; H. N. How, Western Machinery Co.; Oscar Johnson, Mine & Smelter Supply Co.; R. D. Longyear, E. J. Longyear Co.; M. L. McCormack, Ingersoll-Rand Co.; Guy V. Woody, Allis-Chalmers Mfg. Co.; Herbert J. Seakwood, Eimco Corp.; and H. C. Davis, Kanawha Mfg. Co.

Decontrol of Small Mines Asked

Truck mines without rail connections producing 20,000 tons of coal less a year should be exempted from price control, members of the Bituminous Coal Producers' Advisory Committee recommended in their first meeting with officials of the Office of Price Stabilization late in August. Since most of such coal is sold locally, such an action would not harm the larger part of the industry—commercial mines—competitively and would not have a significant effect on coal prices in general, it was said.

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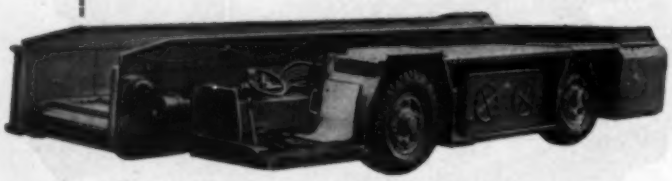

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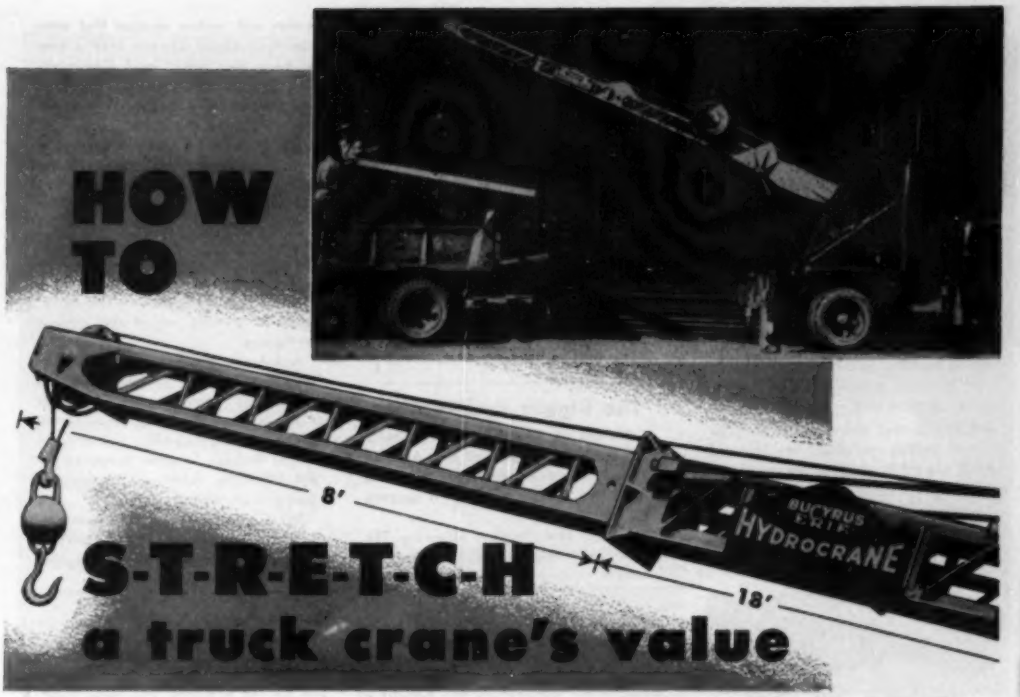

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This telescoping boom combined with other work-saving features makes the Hydrocrane a mine work horse. With every function fully hydraulic, control is extremely precise because power is metered like the flow of water through a faucet. Move a load a fraction of an inch if necessary. And it's all done with finger-tip hand levers. No tricky hand-foot co-ordination.

Special to Mine Superintendents

Have you ever wondered about putting a green operator on a crane? If so, you'll appreciate the Hydrocrane's "dead man" control. If operator lets go, all levers return to neutral — load stops dead. It's great when men are working around the crane load.

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No need for old fashioned hand mucking when it's so fast, easy and inexpensive with a Bucyrus-Erie Hydromucker. Hydraulic bucket controlled from upper shaft loads blasted rubble from shaft floor to skip or other conveyor for removal to surface. Owners report 35 percent faster mucking, 30 percent less manpower by using the new Hydromucker.

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GIVE 'EM AIR

at the lowest possible cost!

SPIRATUBE-M and AYRTUBE cut Air Delivery Costs. Specifically for mine and tunnel ventilation, these two AIRDUCTS individually or in combination, deliver maximum of air right at the working face and at lowest possible cost—because—ease of handling reduces installation costs, and construction features minimize leaks and seepage. You get the full volume created by your fans and blower units right where you need it—at the working face—reducing power costs.

Available in tough high count jute and other fabrics, specially treated and heavily coated inside and out to withstand fungus and mildew and rough usage.

Flexible special (patented) built-in couplings eliminate fabric mangling—no parts lying about to create accident hazards.

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For both positive and negative pressure, or reversible systems. Replaces rigid ducts. Saves shipping, installation, maintenance, and storage costs. Patented concealed spring wire construction springs to work and stays extended. Built-in quick couplings with joints lock ringed against blast concussion. No fittings required for turns or bends.

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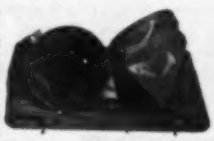

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The Bigger Red Feather

OCTOBER IS RED FEATHER MONTH and in cities and towns all over America United Red Feather campaigns are in full swing. That's traditional. It happens every fall.

But this year there's a difference. The RED FEATHER is a BIGGER Red Feather. Symbol of more than 15,000 health, recreation and welfare services that combine their annual appeals once a year in more than 1,300 local Community Chest campaigns, the RED FEATHER this year has an added assignment: the United Defense Fund.

Our mobilization for the defense of democracy demands efficiency, economy and wise planning in health and welfare services just as it does in industry. The United Defense Fund answers that demand, for it finances the combined strength and know-how of national health, recreation and welfare agencies working together to meet the human problems growing out of the national emergency.

Included in the United Defense Fund are: United Service Organizations, Inc. (U S O); American Social Hygiene Assn.; National Recreation Assn. (emergency defense program); United Community Defense Services; American Relief for Korea (clothing, blankets and sewing materials).

When you contribute with generosity to your local united RED FEATHER campaign, you are helping to strengthen and defend our democracy.

And for Your Information . . .

The Tennessee Coal, Iron & R.R. Co. recently presented its Lloyd Noland Hospital to the Lloyd Noland Foundation Society for the benefit of the communities in the western part of Jefferson County, Alabama. In donating the 41-acre 350-bed hospital, T.C.I. also provided a $750,000 fund for use in erecting and equipping a new outpatient clinic building.

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OKONITE and MANSON tapes

More than 13,000 supervisors and miners in six states have attended safety training courses designed to curtail haulage accidents in the 4 mo since it launched its educational program, the U. S. Bureau of Mines reported last month. The program has been active in West Virginia, Alabama, Tennessee, Kentucky, Virginia and Ohio, and will eventually include all states producing coal.

The Valley Camp Coal Co. has asked residents to vacate company houses at its Mine No. 3, Triadelphia, W. Va., as a safety measure since "the houses are old and income is not enough for maintenance." "Today, it is better that miners own their own homes," a company official said, explaining that families were not being forced out but had been asked to find other accommodations. The buildings are being sold for lumber.

Three new automatic heating units that will burn either coal, gas or oil were recently announced by the U. S. Radiator Corp, as protection to homeowners against shortages of any particular fuel.

The nation's first lignite laboratory was scheduled to be dedicated by the U. S. Bureau of Mines Sept. 29 at Grand Forks, N. D., with Secretary of the Interior Chapman as the principal speaker. Completed last December at a cost of $750,000, the laboratory provides every modern facility

Why you can always rely on Du Pont Iron Wire Electric Blasting Caps

These iron-wire caps have proved their efficiency and value in scores of mines. They assure dependable performance . . . help get the coal out on schedule, and they're economical.

Today, copper-wire caps are in short supply due to the national defense program. But in most cases you'll find Du Pont Iron Wire Caps will do the job equally well . . . at an attractive saving. And, there's an abundant supply of these caps.

Du Pont Iron Wire Electric Blasting Caps are top quality. They have all the desirable features of other Du Pont Electric Blasting Caps including nylon insulation, shielded shunts and rubber plug closures. Moreover, the insulation is white . . . gives the best possible visibility in coal. In addition, the iron wires can be removed by magnetic separators.

Try these dependable detonators in your mine. You'll appreciate their efficiency and economy. Talk it over with your Du Pont Explosives representative. He's always glad to help you in any way he can. E. I. du Pont de Nemours & Co. (Inc.), Explosives Dept., Wilmington 98, Del.

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BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

KOPPERS can work wonders with wood. By chemical impregnation we can change its characteristics so that it will stand up under the toughest conditions. For example, we can make wood resistant to decay, insect attack and marine borers; we can make it acid-resistant. Also important is the way pressure-treatment makes wood better able to withstand abrasive wear.

By retaining its strength, Koppers Pressure-Treated Wood lasts much longer . . . cuts maintenance costs . . . is far safer to use. Here are some pressure-treated products that *deserve* a place in your mine:

"HERE'S SOME SAFER WOOD, SIR!"

AR-MOORED® TIES
(Steel Tops)

LAGGING

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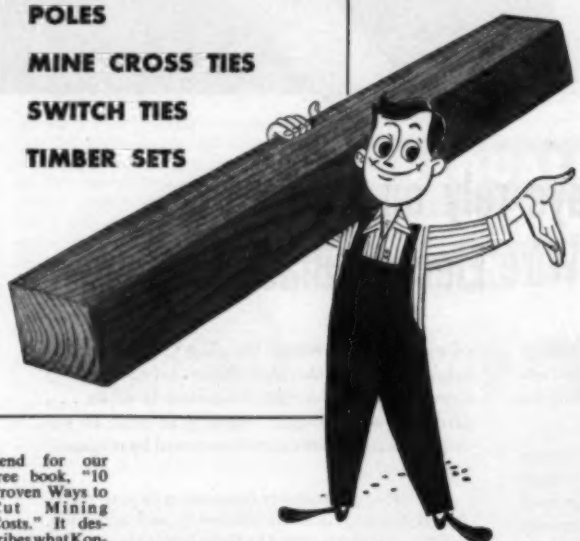

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necessary for studying ways to increase the use of lignite for power, heat and other purposes. It is named in honor of the late Rep. Charles R. Robertson, who initiated and guided the legislation authorizing it.

The Alabama Power Co., is planning to spend some $55,700,000 on new generating capacity in the next 3 yr, bringing its total to 1,384,000 kw by the end of 1953, or 1½ times its capacity before World War II. Transmission and other facilities to be installed will mean a total outlay of over $100 million.

Stripping operators are required to backfill within 15 ft of a highway right-of-way, according to a new Pennsylvania Law signed by Gov. Fine late in August. About the same time it was reported that officials of Forest City (Pa.) had ordered closing of an anthracite stripping as a "public nuisance" and a menace to public health and safety.

COAL MEN ON THE JOB

ISLAND CREEK COAL CO.: Milburn Hall, general mine foreman, Mine No. 27, Holden, W. Va.

BORDERLAND COLLIERIES CO.: V. E. Stanley, general mine foreman, Thacker and Alma mines, Borderland, W. Va.

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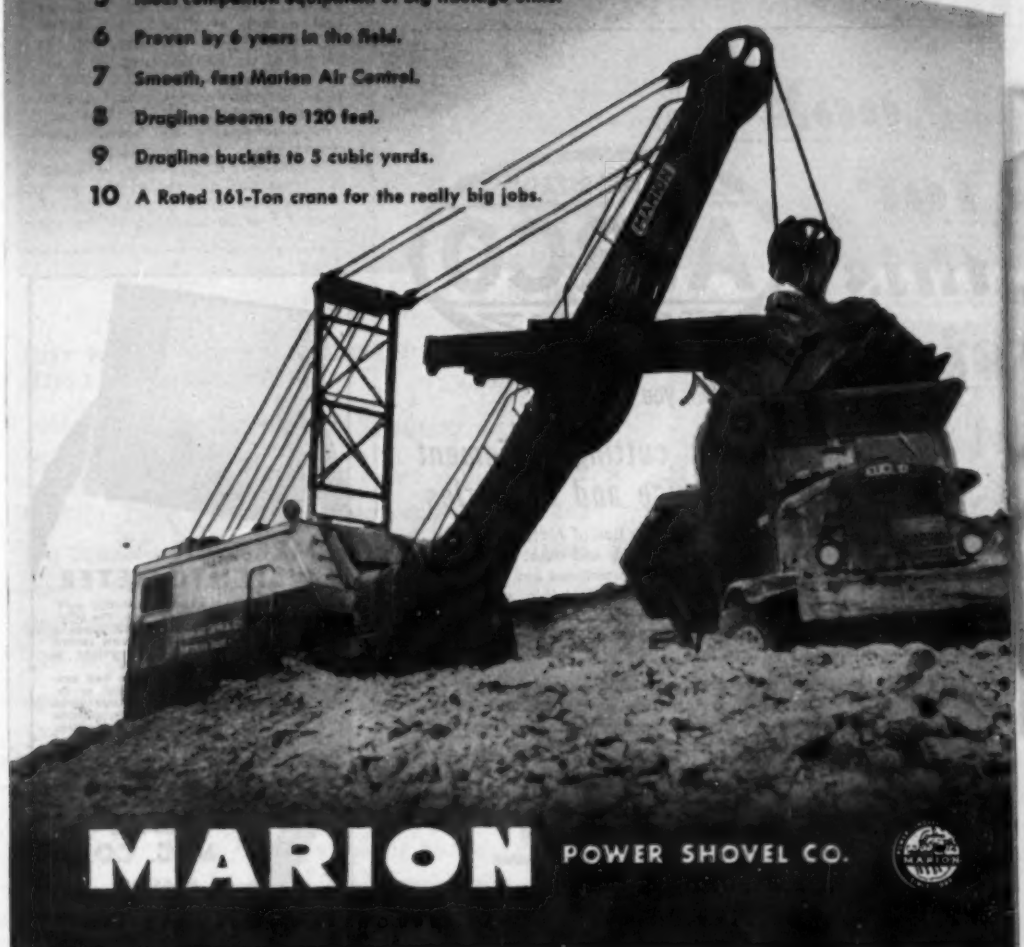
That Really Count!

Get them in the
MARION 111-M

1. Four cubic yard dipper capacity.
2. Electric swing on a diesel machine.
3. All-electric if desired.
4. Ships on two rail cars.
5. Ideal companion equipment of big haulage units.
6. Proven by 6 years in the field.
7. Smooth, fast Marion Air Control.
8. Dragline booms to 120 feet.
9. Dragline buckets to 5 cubic yards.
10. A Rated 161-Ton crane for the really big jobs.



MARION POWER SHOVEL CO.

And for Your Information . . .

Construction of a 40,000-kw steam power plant, on the Kentucky River near Ford, will be started late this month by the East Kentucky Rural Electric Cooperative Corp. The plant, expected to cost $12 million initially, is being fought by the Kentucky Utilities Co., which has suggested that the co-op install its plant at Tyrone, Ky., and use Kentucky Utilities' distribution lines to save construction costs. However, government loans cannot be secured on such a working basis, co-op officials report.

Cleaner Air Week, sponsored by the Air Pollution and Smoke Prevention Association of America will be observed throughout the nation from Oct. 21-27. Governors of most states and mayors of hundreds of cities are issuing proclamations to officially recognize the event, which is designed to focus attention on the need for the control of air pollution.

Development of coal resources in Washington, Idaho, Montana and Alaska for the production of electric power and coal by-products was to be asked for in a resolution at a meeting of the Pacific Northwest Trade Association opening Sept. 17 at Missoula, Mont. Study and pilot-plant development by the USBM is to be sought, along the lines of the recently announced utilization of Texas lignite. The group is composed of Chamber of Commerce representatives and others from four Pacific Northwest states and two Canadian provinces.

During July and August some 4,895,000 tons of U. S. Coal was shipped to Western Europe. The volume of coal moving to Western Europe is now close to the post-war peak, attained in August, 1947.

Britain Seeks to Up Coal Output In Return for U. S. Steel

Every effort will be made to supply Great Britain with 2 to 3 million tons of steel during the coming year, Charles E. Wilson, Defense Mobilization Director, told Hugh Gaitskell, Chancellor of the Exchequer, during the latter's visit to the U. S. last month. "In return for" the much-needed steel, Mr. Gaitskell was reported to have proposed that Great Britain would boost its production of coal enough to provide substantial exports to West Germany, for the benefit of German industry. How the proposed increase in coal output is to be effected was not indicated, even though Britain is already threatened with a renewal of its domestic coal shortage during the coming year.

In reporting British mine operations in the second quarter of this year, the National Coal Board Sept. 14 showed a much larger profit for the

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The local Airco dealer carries a complete line of Airco equipment and supplies. High-purity oxygen, acetylene and other gases . . . calcium carbide . . . gas cutting or welding machines and supplies . . . arc welders, electrodes and accessories . . . he'll deliver anything you need from stock, direct to your door. He's part of a nation-wide Airco organization that has been set up to supply you promptly, regardless of your location.

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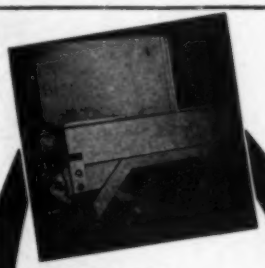

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While material is smoothly moving along a conveyor, the MERRICK WEIGHTOMETER keeps a continuous and accurate record of weights. Total weight is available at a glance.

Applied to any size belt conveyor, either horizontal or inclined. The weightometer gives a simplified and dependable record of your production, without interrupting the flow of coal.

Write for Bulletin 375

MERRICK SCALE MFG. CO.

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Photographed on the job, Boswell, Pa.

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With Two SECO Vibrating Screens

Take it from M. F. Fetteroff, owner of the Fetteroff Coal Co. Today's coal buyers won't settle for anything less than clean, accurately sized coal. That's why this company's ultra-modern tipple at Boswell, Pa., is equipped with two Seco vibrating screens . . . with wire cloth openings of 3/4", 1 1/4" and 2". These smooth operating Seco's take the plant load of 175-200 tons per hour and accurately deliver all required sizes.

"They're the smoothest running screens I've ever seen," says Mr. Fetteroff, "and the results speak for themselves. We are finding a waiting market for every ton we produce . . . and most important, we're able to make a fair profit on every ton."

SECO

TRUE CIRCULAR ACTION

VIBRATING SCREENS

MODERNIZE NOW!

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In Canada: United Steel Corp., Toronto, Ont.

period, mainly, it appeared, as a result of a sharply reduced, though still considerable, loss on imported coal. The surplus was £3,105,000, compared with £983,000 in the previous quarter and £2, 452, 000 in the second quarter of 1950. Total costs of operation were 2/9.9d per ton higher than during the second quarter of 1950 and 1/3.5d higher than in the first quarter of 1951, the main increases being in wages.

Plans for a new anthracite colliery costing approximately $21,000,000 and designed for the production of 1,000,000 tons of salable coal a year were announced by the National Coal Board recently. Located near Llanelly, Wales, the project will mine seven seams with total reserves of some 100 million tons. While plans have been under preparation for some time, final proving of the seams was not possible until last May when a 2,550-ft borehole was completed. Two shafts, 24 and 20 ft in diameter, will be sunk to depths of approximately 2,280 and 2,080 ft. Planned as an all-electric operation with locomotive and mine-car haulage, the colliery will employ some 3,450 men, 600 more than now working at six neighboring collieries, most of which are approaching exhaustion. First production is expected to begin in 1956, with full capacity reached by 1962.

Europe Faces Coal Deficit; Seeks Increased Output

Preliminary study indicates that Europe faces a deficit of roughly 12 million tons of coal and 5 million tons of coke during 1952, the United Nations Economic Commission for Europe reported early last month. The 18-nation Coal Committee urgently appealed to coal-exporting countries to increase their output by 150,000 tons of coal and 175,000 tons of coke above the deficit already estimated for the last quarter of 1951, to give coal-importing countries "austerity satisfaction." The European coal and coke deficit for 1951 has been estimated at some 11½ million tons.

AUSTRALIA—American coal companies should be asked to develop some of the Australian coal fields, J. L. Knott, Australian Federal Director of Defense Production Planning, recently proposed. That "might engender a little healthy competition in the coal industry" as well as result in the development of some rich coal fields which would otherwise remain unexploited or developed only in a slow and uneconomic manner, he pointed out. The proposal may be studied by the federal government if Australia's inadequate coal production continues to seriously affect its steel output and its economy in general.

PORTABLE
COAL PREPARATION UNITS

(Patent Pending)

• Comprised of hopper, feeder, screen, picking table and single roll crusher. Capacity—125 or 150 tons per hour. Large heavy-duty Timken double-row roller bearings in the eccentrics and pillow blocks. Over-size Torrington spherical roller bearings in the crusher. The crushers are adjustable from ¾" to 10" opening. Screened coal over the picking table is diverted by a flap-gate to the crusher or mixed with the slack for mine-run. The screen has a snappy action, resulting in efficient screening.

The picking table has a smooth motion which allows selective picking of the impurities which are disposed of in the trough running over the center of the picking table.

The unit is equipped with magnetic starters and push-button controls, 10 to 15 HP motor on the crusher, 5 HP motor on the screen and picking table. It can be readily transported from one location to another on a standard long-wheelbase truck, with minimum cost for moving and erecting.

When used in conjunction with a belt or chain conveyor, the unit can be adapted to various arrangements for handling the coal from the trucks or mine cars, through the cleaning unit, to the railroad cars or bins.

The use of oversized anti-friction bearings throughout these two unit sizes insures trouble-free operation, with low power and maintenance costs.
Full information upon request.

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Drop Forged Links

Drop forged for strength, Superior Swivel and Single Link Couplings are built to stand the gaff. No welds to let go with resulting wrecks. Superior Couplings on your mine cars will prevent accidents and reduce haulage costs. Order Superior Couplings for your replacements and specify them on new equipment.

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"EUCS" haul MORE TONNAGE at LESS COST

Rear-Dump Euclids of 10 to 34-ton payload capacity have a wide range of body designs . . . they're unmatched for efficiency on the haul road and dump . . . with travel speeds up to 35.7 m.p.h. . . . powered by diesel engines of 125 to 400 h.p.

Combining rugged construction, large capacity and fast loaded travel speeds, Rear-Dump "Eucs" and Euclid Bottom-Dump Coal Haulers provide high production and low cost hauling in open pit mines. Designed to work with large loading equipment, "Eucs" are built for heavy duty off-the-highway service.

Ask your Euclid Distributor for a cost estimate on jobs similar to yours. Euclids are your best bet for hauling coal from pit to tipple.

Euclid Bottom-Dump Coal Haulers are built as a complete unit, with proper weight distribution, plenty of power and ease of handling. Powered by diesel engines to 300 h.p. . . . loaded speeds up to 34.4 m.p.h. . . . available in 20 to 40-ton capacities.

The EUCLID ROAD MACHINERY Co., CLEVELAND 17, OHIO

EUCLIDS

"Does an Excellent Job" *says*

Pilgrim Coal Co. Volant, Pa.

---about their

EAGLE STOKER COAL CHIPPER

THE Pilgrim Coal Company, Volant, Pennsylvania uses this Eagle Coal Chipper for converting nut coal into stoker. "We like the compactness of this unit . . . as well as the low operating cost. Does an excellent job of producing 40-50 tons of stoker-coal per hour . . . we would never hesitate to recommend this package unit."

You can make stoker-coal for as little as 50c per ton and in some cases even less. Choice of gears for ⅜" to ¾" or ¾" to 1¼" reduction sizings. Packaged unit with electric motor (as shown) or gasoline engine. Either stationary or portable wheel mounting. Write for Bulletin 649 for the complete story.

Olson Self-Dumping Mine Gages and Coal Cracker Reduction Units.

SINCE 1872 Progress...Service

EAGLE IRON WORKS

181 Holcomb Ave. Des Moines, Iowa

COMMERCIAL STEEL BEAMS

Commercial Steel Beams are ideal for mine entry roof supports not only due to their ease of installation, but because of the safety they afford workmen during and after being erected . . . For safe, permanent roof supports specify Commercial Steel Beams . . . Commercial Supports are available in every size and radii for every job.

THE COMMERCIAL SHEARING AND STAMPING CO.

Youngstown 1, Ohio

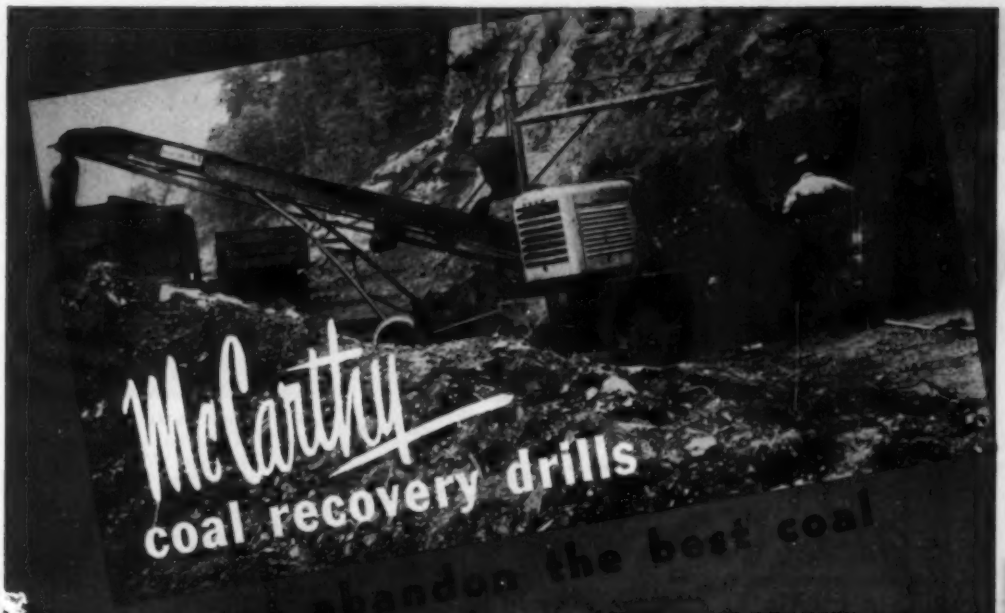
SOUTH AFRICA—The purchase of surface and mineral rights to some 20,000 acres of land 30 mi south of Johannesburg for use of the state-owned oil-from-coal project now under development has been completed. As previously reported, the coal-gasification plant will be set up to produce initially 60 million gal of gasoline and diesel fuel a year, with its capacity to be later increased to 100 million gal.

BRAZIL—In a message to the Brazilian Congress, President Vargas Aug. 9 asked for the adoption of a 5-yr plan for the improvement of the country's coal industry. The program, which would cost some $40,425,000, includes the purchase of new modern mining machinery and loading and transport facilities.

COAL MEN ON THE JOB

LECKIE COLLIERIES CO.: J. F. Kinder, construction foreman, and in the background, the scalping and crushing plant he recently completed at the new Alma No. 1 mine of the Borderland Collieries Co., Borderland, W. Va.

BORDERLAND COLLIERIES CO.: T. J. Roark (left), company superintendent, and J. E. Watters, assstant foreman of Alma No. 1 mine, Borderland, W. Va.



McCarthy
coal recovery drills
do not abandon the best coal

Heavy-Rugged Powerful

50th year
SALEM
1901-1951

The McCarthy Coal Recovery Drill starts in where the shovels leave off . . . in those rich veins which have been untouched because of too costly overburden removal. The McCarthy Drill bores horizontally or at the angle . . . mining and loading in one continuous operation.

Consider the operation illustrated here: a 30-inch McCarthy drill is shown at work on the coal drilling operation of L. E. Grant near Edwight, Raleigh County, West Virginia. The huge power-driven drill bores the coal out of the rich seams after stripping has mined as much of it as it is profitable to recover that way. The 30-inch drill comes in six-foot sections, and 17 of them are used at this particular operation to drill a hole 101 feet back in the mountain. A three-man crew can produce 90 tons of clean coal in an eight-hour shift, a portable conveyor being used to load the coal into trucks. Grant has two such drilling outfits at work near Edwight. Rish Equipment Company, McCarthy drill distributor in the two Virginias, has sold sixty drills for this unusual method of coal mining.

McCarthy drills can be used for strip or deep mine operations. Available in diameters of 12, 16, 20, 24, 30, 36, 42 and 48-inch.

Let us have your inquiries which will be referred to our nearest distributor. Write today for the full story on the revolutionary McCarthy Coal Recovery Drill.

MANUFACTURED BY
SALEM
THE SALEM TOOL CO.
763 S. ELLSWORTH AVE. • SALEM, OHIO, U. S. A.

CABLE WEAR PROBLEMS ?

Now you can strengthen your cable so that it can be dragged *anywhere* with complete safety. Ruberoid Insulating Tape does more than just "patch" a cable splice; equally adhesive on *both* sides, it has an inter-bonded grip that holds the spliced cable with vise-like power. It's no wonder that Ruberoid Insulating Tape has led in the cable-maintenance field for more than half a century!

Check these Cost-Cutting Features:

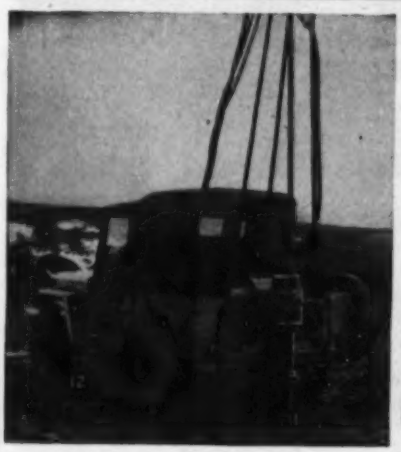
- ☐ Double grip . . . both sides adhesive
- ☐ Resists abrasion
- ☐ Great tensile strength . . . tough
- ☐ Acid and alkali-proof
- ☐ Won't tear, ravel or pucker
- ☐ Extra thick . . . one layer insulates
- ☐ Exceeds A.S.T.M. specifications by 300% in adhesiveness, 26% in tensile strength, 290% in dielectric strength.

The RUBEROID Co.

EXECUTIVE OFFICES:

500 Fifth Avenue · New York 18, N. Y.

MORE YEARS FOR YOUR DOLLAR WITH RUBEROID BUILDING MATERIALS



how to save time, labor, money in STRIP MINING

Acker TEREDO Core Drills accurately measure depth of overburden thickness and quality of coal seams

The Acker Teredo core drill will tell you quickly, inexpensively, positively the exact condition of coal seams up to depths of 600 ft.

Sturdy enough to withstand the most rugged conditions, yet light enough to be portable, the Teredo can be mounted on truck, trailer, jeep or skid.

In bituminous fields, the Teredo can operate the specially designed double tube core barrel which will retrieve accurate samples, even where others have failed.

Write today for information and Bulletin 4C-CA.

ACKER DRILL COMPANY Inc., Scranton 3, Penna.

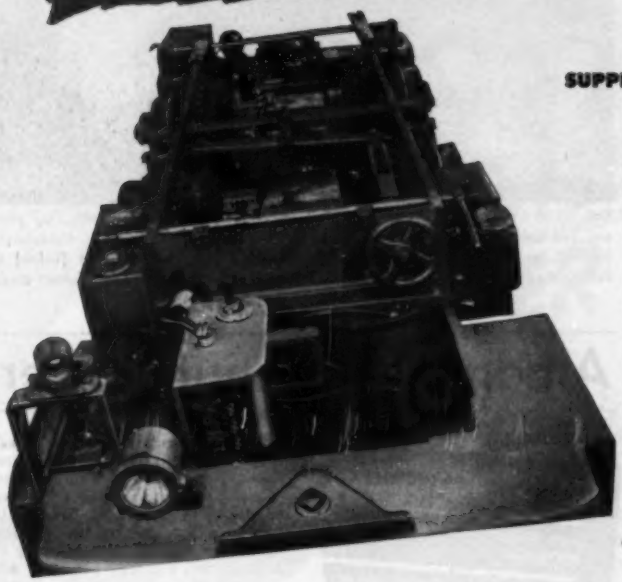
COAL MEN ON THE JOB

ISLAND CREEK COAL CO.: Thurston Strunk, superintendent, Mine No. 27, Holden, W. Va.

LECKIE COLLIERIES CO.: G. F. Kennedy, chief electrician, Aflex, Ky.

LECKIE COLLIERIES CO.: J. L. Lawson, assistant mine foreman, Thacker mine, Aflex, Ky.

Whatever your Mine Locomotives need to keep them in good running condition NATIONAL ELECTRIC COIL CAN DO!



COMPLETE REBUILDING

SUPPLYING REPLACEMENT COILS

MOTOR OVERHAULING

CONTROLLER REPAIRING

MECHANICALLY DAMAGED MOTOR REPAIRING

SPLIT FRAME MOTORS MADE INTO SOLID FRAME MOTORS

TIRE RETREADING

A LOCOMOTIVE BEING COMPLETELY REBUILT IN OUR BLUEFIELD PLANT

The National Electric Coil Company was born in the coal mining field. Our first plant, in Bluefield, West Virginia, and our new plant in Harlan, Kentucky, are equipped and manned primarily for service to the mining industry. Key people are "graduates" of work in the mines. Either plant can handle any mine locomotive job, from continuous-weld tire tread rebuilding to complete locomotive rebuilding. Overflow coil and motor work from either plant is done in our Columbus, Ohio plant.

Locomotives can be delivered to us via our truck or yours, or by flat car. Motors can be rewound in your shop or ours. And National electrical work is done with a full knowledge of the rugged life of electrical apparatus in mining.

If you don't know the National field engineer near you, drop us a line. He knows your problems; he's there to help you.

BRONZE
REPLACEMENT
PARTS

Flood City Bronze Bearings and replacement parts are cast from a superior grade of hard, long-wearing bronze, and are machined by experts for perfect fit.

All standard bronze replacement parts for all types of mining equipment are carried in stock, and we are equipped to make any special bearings to fit your particular needs. Please write for estimates on your requirements.

FOR LOWER MAINTENANCE COSTS AND LONGER SERVICE, SPECIFY FLOOD CITY BRONZE REPLACEMENT PARTS.

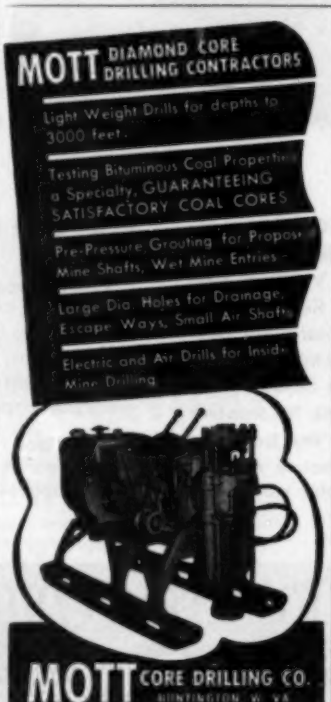
Prompt deliveries can be made from complete stocks carried in both Johnstown and Charleston.

FLOOD CITY
BRASS & ELECTRIC CO.
JOHNSTOWN, PA.
BRANCH OFFICE: CHARLESTON, W. VA.

COAL MEN ON THE JOB

THE NEW RIVER CO., Skelton mine, Skelton, W. Va.: On the night shift (top photo) are: Ted Cain (left) and Will[illegible]Hedrick, section foremen; John Grimes, transportation foreman; and Jess Quesenberry, section foreman. Working the day shift (below) are: Everett Gaylor (left), Thomas Gargas, and Bill Voloski, section foremen; Herbert Bressler, transportation foreman; and J. F. Tillman, fireboss.

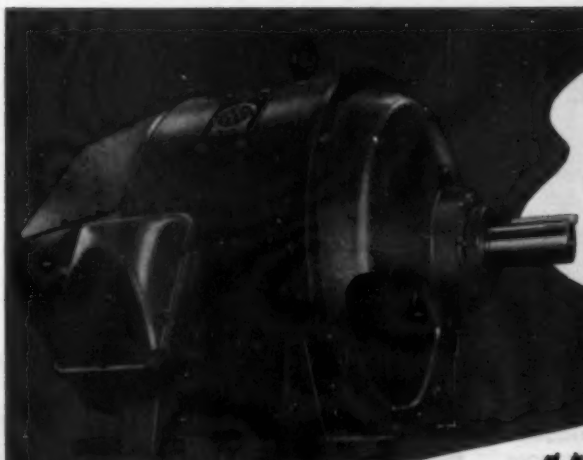
Among the Manufacturers


MOTT DIAMOND CORE DRILLING CONTRACTORS
Light Weight Drills for depths to 3000 feet.
Testing Bituminous Coal Properties a Specialty, GUARANTEEING SATISFACTORY COAL CORES
Pre-Pressure Grouting for Proposed Mine Shafts, Wet Mine Entries
Large Dia. Holes for Drainage, Escape Ways, Small Air Shafts
Electric and Air Drills for Inside Mine Drilling
MOTT CORE DRILLING CO.
HUNTINGTON, W. VA.

Ray L. Hampton, formerly sales manager, has been named vice president in charge of sales, Mosebach Electric & Supply Co., Pittsburgh. Before joining Mosebach Electric last January, Mr. Hampton was manager of the Controller Block Supply Co., Kermit, W. Va., and also was associated with the Superior Sterling Co., Bluefield, and the Duquesne Mine Supply Co., Pittsburgh.

Edwin H. Howell has been appointed assistant manager of the east central district of the General Electric Co.'s Apparatus Marketing Div., with headquarters at Cleveland. Associated with GE since 1922, Mr. Howell formerly was a special Apparatus Div. representative in Washington, D. C. Arthur R. Hines, manager of the Michigan sales district of the company's apparatus lines since 1949, has been appointed assistant manager of marketing for General Electric, with offices in New York.

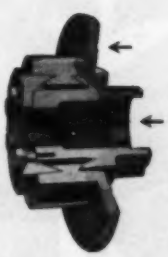
Austin L. Hawk has been named assistant manager of the western sales district, Manhattan Rubber Div. of Raybestos-Manhattan, Inc., with headquarters in Chicago, where he has served in the various capacities for many years. Other advancements recently announced include the appointments of A. N. Johnston, Jr., as assistant manager of the central sales district, Pittsburgh, and D. H. Cottrille as West Virginia regional manager at Clarksburg.



RELIANCE
TYPE 'T' HEAVY DUTY D-C. MOTORS

THE TOUGHEST MOTORS EVER BUILT...

Completely assembled Type 'T' armature, Reli-X insulated and dynamically balanced.



Cross-sectional view of armature with high risers and sturdy spiders indicated.

because since the building of the first Type "T" D-c. Motor nearly 50 years ago, users have contributed from their experience to help Reliance engineers increase the stamina of the Type "T" design to meet the most grueling service conditions encountered in industrial applications.

Heavy duty armatures, for example, feature cores of high-grade silicon steel punchings and shafts which have been finish-ground to assure accurate fits. All armatures are Reli-X insulated and dynamically balanced. High-riser type commutators are designed and built to meet overspeed requirements. Further facts about the heavy duty construction of armatures and other vital parts of Reliance Type "T" D-c. Motors are detailed in Bulletin C-2001. Write for this handy reference which also gives mechanical designs, dimensions and selection data on Type "T" Motors from 3/4 to 1000 horsepower for constant and adjustable-speed operation.

RELIANCE ELECTRIC AND ENGINEERING CO.

1055 Ivanhoe Road, Cleveland 10, Ohio • Sales Representatives in Principal Cities

STOP RUST

FREE SURVEY: Place your rust problems in the hands of a RUST-OLEUM specialist. He will survey your plant for all rust problems, submit detailed recommendations, and make specific tests.

You can stop rust with RUST-OLEUM! An exclusive formula proved in a wide range of industrial and marine applications for more than 25 years. Its tough, pliable film dries to a firm rust-resisting coating that protects against rust—cuts maintenance costs—adds years of use to many metal surfaces, indoors and outdoors.

RUST-OLEUM may be applied over rusted surfaces without removing all the rust, assuring substantial savings in preparation time... It is only necessary to remove all the rust scale and loose rust.

Prompt delivery from Industrial Distributor stocks in principal cities. See *Sweets* for complete catalog and nearest source of supply, or write for complete literature on your company letterhead today!

Beautifies AS IT PROTECTS

Available in many COLORS, aluminum and white

"Rigid Economy, Men"

RUST-OLEUM CORPORATION

2461 Oakton Street, Evanston, Illinois

New Office Completed

NEW HOME OFFICE BUILDING recently occupied by the Allen-Sherman-Hoff Co. at Wynnewood, Pa., a few miles west of Philadelphia, is thoroughly modern and functional in design. Each office is individually air conditioned and excellent lighting is provided by glass block windows and fluorescent fixtures. Ample parking space is provided for both employees and visitors. The company formerly was located in Philadelphia.

Pettibone Mulliken Corp., Chicago, has announced a major reshaping of sales policies for most of the Pettibone Mulliken companies, including Hammermills, Inc., Chicago; Universal Engineering Corp., Cedar Rapids, Iowa; and George Haiss Mfg. Co., Inc., New York. To formulate and coordinate the sales advertising activities of the various companies, W. E. Madden, formerly vice president of George Haiss Mfg. Co., Inc., has been named director of sales for the organization, and J. M. Hume, formerly vice president of Universal Engineering Corp., has been named assistant director of sales.

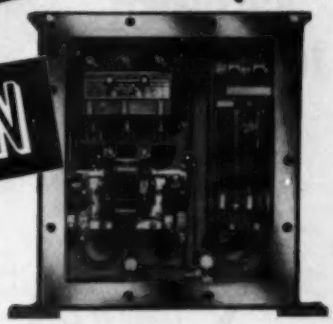
Firth Sterling Steel & Carbide Corp., Pittsburgh, has appointed E. William Kalb as assistant manager of its steel sales division. Mr. Kalb formerly served as supervisor of tool steel sales for the Chicago branch of the Crucible Steel Co. In the company's carbide research and development department, William W. Wellborn, associated for the past 5 yr with the Los Alamos AEC Scientific Laboratories, has been named research engineer.

John B. Madden has been appointed hydraulic sales manager for the north central district of A. O. Smith Corp., Milwaukee, with headquarters in Chicago. Mr. Madden, former product supervisor, previously handled hydraulic sales from A. O. Smith's Houston works.

H. S. Bishop, formerly with the rail and track division of West Vir-

For the Best in Design ...

BUY ENSIGN



Photograph illustrates Bulletin 6320, size 2 starter, 25 H.P., 440 volts, A.C., explosion-tested, across-the-line, non-reversing.

ENSIGN-CLARK A. C. Explosion-Tested Mine Starters—for use in gaseous mines. These starters have passed all tests of the U. S. Bureau of Mines for explosion-tested equipment and letters of suitability will be furnished on request.

ENSIGN-CLARK A. C. Explosion-Tested Starters are available in 220 or 440 volts, reversing and non-reversing.

Write for further information.

ENSIGN ELECTRIC AND MANUFACTURING CO.

816 Adams Ave. Huntington 4, W. Va.

READ IT!

"DOING A GREAT JOB . . .
WE'RE MORE THAN SATISFIED"

This letter is typical of the many received from satisfied Gundlach Crusher owners.

READ IT!

BARBARA-KAY COAL COMPANY
MARION, ILLINOIS

J. Gundlach Machine Company,
Belleville, Illinois.

Gentlemen:

June 7, 1951

You can quote us as pleasantly surprised to find that the Gundlach Coal Crusher so far outdoes in actual performance the generous promises made by your representative.

The convenience of being able to reduce Mine Run to Stoker Coal in one handling operation in a single compact space-saving machine is paying us healthy dividends daily in savings of time and labor.

Our maintenance engineer reports that the easy accessibility of all bearings for lubrication and general maintenance is a definite economy factor. Out in the yard, the foreman has commented on the savings in time and handling through being able to change coal sizes without interrupting the crusher's operation. He draws attention as well to the very small percentage of waste. The Gundlach Crusher seems to do its job in a clean efficient manner, reducing wasteful pulverization to a minimum.

Please have your representative drop in on us on his next trip our way.

Very truly yours,

Kenneth B. Barbara

SEND FOR BULLETIN CA

T. J. GUNDLACH Machine Co.
BELLEVILLE, ILLINOIS

52 YEARS

CUSTOM-ENGINEERED
MINE CARS . . .

ENTERPRISE
WHEEL AND CAR CORPORATION
BRISTOL, VIRGINIA - TENNESSEE
HUNTINGTON, WEST VIRGINIA

ginia Steel & Mfg. Co., Huntington, W. Va., has joined the Builders Steel Supply Co., Dearborn, Mich., as assistant to M. Mitshkun, vice president.

C. W. Miller has been named manager of large power transformer engineering for the Transformer Div., Westinghouse Electric Corp., Sharon, Pa., succeeding W. G. James, who died Aug. 10. Mr. Miller joined Westinghouse in 1928 and has been section manager in charge of the shell form section since 1949.

Allis-Chalmers Mfg. Co. last month elected four new vice presidents, as follows: W. G. Scholl, formerly general sales manager of the tractor division, elected vice president in charge of sales for the division; C. W. Schweers, director of sales in the general machinery division, named vice president in charge of sales for that division; J. F. Roberts, formerly director of engineering, vice president in charge of engineering for the general machinery division; W. A. Yost, manager of the mechanical power department, named a vice president of the general machinery division. G. F. Langenohl, assistant treasurer, was elected treasurer and also appointed assistant secretary.

H. Gordon Smith, vice president and general manager of the textile division, has been named to the newly created post of executive vice president of the U. S. Rubber Co., New York. William E. Clark, assistant general manager, has been elected a vice president and made general manager of the textile division.

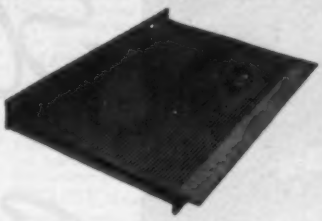
Paul W. Arnold and Richard A. Geuder have been promoted to new responsibilities in the general sales organization of the Reliance Electric & Engineering Co., Cleveland. Mr. Arnold, manager of product sales for several years, has been named to the newly created post of executive assistant to the sales vice president. Mr. Geuder, who has headed the company's application engineering work since 1944, has been made manager of its new department of applied engineering and industry sales.

J. B. Templeton has joined the National Mine Service Co. as a sales representative covering the Illinois and Indiana fields, with headquarters in Herrin, Ill. For the past 5 yr, Mr. Templeton has represented the American Mine Door Co. in approximately the same territory.

Worthington Pump & Machinery Corp., Harrison, N. J., has opened a branch office in Harrisburg, Pa., at 506 Hall Bldg., 2nd & Locust Sts., in charge of A. L. Mays.

A new company, the Ajax Electric Motors Co., 200 Troup St., Rochester, N. Y., has been formed under the presidency of David Lipsky, to serve as world-wide distributors for new electric motors, control equipment and transformers.

for more efficient coal preparation



Hendrick Wedge-Slot Screens

These continuous slot screens are unequalled for a wide range of screening and dewatering operations. For heavy media, they are used as chute bottoms for dewatering and media recovery; for drum and wheel sections; on vibrators. For jigs and other wash box types, they are used for jig bottoms; and for dewatering and wet screening on shakers, vibrators, and stationary equipment.

For separating cones, with or without sand, they are used for recovery of sand and surplus moisture; for dewatering and wet screening. For chloride washers, they are used for circulating, drain and refuse boards; for drainage, recovery of chloride and screening.

1876—Seventy-Fifth Anniversary—1951

See our catalog in Sweet's

HENDRICK

Manufacturing Company

Perforated Metals
Perforated Metal Screens
Wedge-Slot Screens
Architectural Grilles
Mico Open Steel Flooring,
Shur-Site Treads, Armorgrids

41 DUNDAFF STREET, CARBONDALE, PENNA.

Sales Offices In Principal Cities

The Swing is to Durakool a dependable

10 YEAR SWITCH

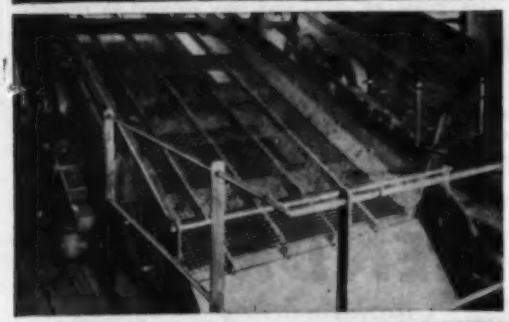
Steel-clad with mercury to mercury contacts, the Durakool hydrogen filled switch is performing with sensational dependability.

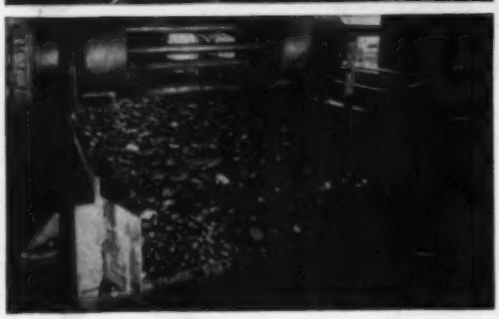
- ★ Millions of contacts without a falter
- ★ Positive "Make and Break" contact action
- ★ Withstands high temperatures
- ★ No deterioration in storage
- ★ Seven new models—1 to 65 amperes
- ★ Smaller in size, increased capacity

Send for BULLETIN 525

Steel Durakool MERCURY SWITCHES

See Telephone Directory for Local Distributor or write Durakool, Inc. Elkhart, Indiana





SCREEN IT ACCURATELY

SCREEN IT ECONOMICALLY

—on Hewitt-Robins Vibrating Screens

You need closest possible control of sizes. You need lowest possible cost per ton. You can get both by putting the right vibrating screen on the job.

Here's where Hewitt-Robins can help. We introduced the circle-throw principle. We originated the elliptical throw. Today, we make vibrating screens in a wide range of types and kinds . . . handling everything from 9,000 lb. rocks to tiny specks . . . to perform every operation from scalping through sizing to dewatering.

The line of Hewitt-Robins Vibrating Screens is complete . . . ranging from 16" x 30" to 72" x 192" . . . floor mounted or suspended . . . with one, two or three decks.

Proper sizing is no problem . . . when you put it up to Hewitt-Robins. Your cost per ton will be low. Your maintenance expense will be minor; many Hewitt-Robins Vibrating Screens are still going strong after more than 12 to 20 years of continuous service.

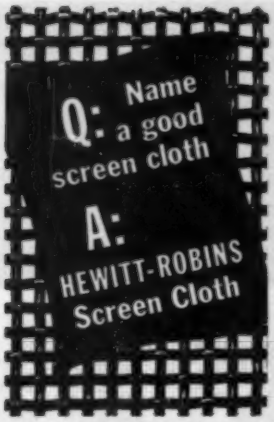
Screen your product accurately. Screen it economically . . . on Hewitt-Robins Vibrating Screens. Tell us your need. We'll give you the *one best* answer. Write to Robins Conveyors Division, Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.

Hewitt-Robins is participating in the management and financing of Kentucky Synthetic Rubber Corporation.

HEWITT-ROBINS VIBRATING SCREENS

HEWITT-ROBINS HR INCORPORATED

BELT CONVEYORS (*belting and machinery*) • BELT AND BUCKET ELEVATORS • CAR SHAKEOUTS • DEWATERIZERS • FEEDERS • FOAM RUBBER PRODUCTS • FOUNDRY SHAKEOUTS • INDUSTRIAL HOSE • MINE CONVEYORS • MOLDED RUBBER GOODS • RUBBERLOKT ROTARY WIRE BRUSHES • SCREEN CLOTH • SKIP HOISTS • STACKERS • TRANSMISSION BELTING • VIBRATING CONVEYORS, FEEDERS AND SCREENS



BECAUSE you increase the time between screen cloth changes—on *any make* of screen!

BECAUSE Hewitt-Robins Screen Cloth is made of Super-Gyraloy, the specially blended alloy steel wire that's the toughest, hardest screening surfaceeverdeveloped.

BECAUSE Hewitt-Robins Super-Gyraloy Screen Cloth comes in the *weave* you want . . . the *size opening* you need.

BECAUSE its heat treatment and microstructure make Super-Gyraloy highly resistant to abrasion without sacrificing ductility. You can actually bend a wire of this cloth around its own diameter without fracture.

SEND TODAY for Bulletin No. 113-A. Fully describes Hewitt-Robins Super-Gyraloy Screen Cloth, 3/16" to 6" openings, made from #12 gauge wire to 5/8" rod in square and rectangular openings, flat top and non-blind weaves. Also in Gyraloy (spring steel) stainless steel, Monel metal, brass or enamel coated in any standard diameter of wire. Robins Conveyors Division, 270 Passaic Ave., Passaic, N. J.

HR HEWITT-ROBINS SCREEN CLOTH

ATLAS
STORAGE BATTERY LOCOMOTIVES
are more efficient than any other . . S-B Locomotive

7 TON
42" HIGH

PERMISSIBLE
Approved by the Bureau of Mines for gassy locations.

Atlas Permissible Locomotives have long been famous for dependability and their ability to out-perform all others. Maintenance costs are notably low. These permissibles provide the ultimate in safety and accessibility.

ATLAS ENGINEERING SERVICE — IS ALWAYS AT YOUR SERVICE

Complete details and specifications on request.

THE ATLAS CAR & MFG. CO.

Correcting the Record

An error in the report of the meeting of the West Virginia Coal Mining Institute (*Coal Age*, August) has been called to our attention by Martin L. Markel, of the Joint Industry Safety Committee, Washington, D. C. In mention of a paper on "Roof Drilling With Dust-Control Equipment" by James Westfield of the USBM, the report (p 177) stated in part: "Permission to use dry dust collectors has been asked of the Bureau of Mines by the Joint Industry Committee."

Actually, Mr. Westfield's paper said: "The test work on dust collectors at the Experimental Mine has progressed sufficiently to offer convincing evidence that an acceptable dry dust collector will be developed, and the Bureau of Mines has proposed to the Joint Industry Safety Committee a revision of Article IX, Section 1b, to permit the use of dry dust collectors with pneumatic drills." Mr. Westfield's statement was inadvertently transposed in editing the report prepared by the staff member attending the meeting and The Editors regret any inconvenience or misunderstanding that may have resulted.

Seek to Enlarge Supply of Engineers

Ways and means of conserving and increasing the national supply of engineers for growing civilian and military needs were explored Sept. 28 at a day-long meeting of engineers, educators and industrialists at Pittsburgh, Pa. Though most of the group came from the Pittsburgh area, engineers from other regions of the Nation observed the proceedings and discussions with a view to staging similar convocations in their own areas.

The Pittsburgh meeting, held under auspices of the Engineering Manpower Commission of the Engineers Joint Council, spotlighted the critical need for engineers and sought to develop plans whereby military and civilian needs can be reconciled. G. A. Shoemaker, vice president, Pittsburgh Consolidation Coal Co., presided.

Headline speakers, with brief summaries of their remarks, were as follows:

A. C. Monteith, vice president, Westinghouse Electric Corp.—The need for engineers in developing national welfare and security; winning the public to an understanding of the importance of engineers in the American way of life.

S. C. Hollister, dean, Cornell University—The prospective decrease in the number of graduates from engineering colleges in the years ahead; specific suggestions on how to revise the Nation's pattern for utilization of engineers to spread the supply and serve the national interest.

M. H. Trytten, National Research Council—How government agencies

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COAL MEN ON THE JOB

PINE TOWNSHIP COAL CO., Hollwood, Pa.—Caught between shifts were the following facebosses: right photo—Matt Kraynack (left), John Lewis, George Stronko and Elsie Barr. Below—Ben Bassaro (left), Joe Tomasko, Bob Connor, Steve Popvich and Maynard Lemmon.

and policies can be modified to ensure best utilization of engineering manpower; how the government has set up agencies to help with the problem.

C. H. Brown, manager, Engineering & Manufacturing Services, Eastman Kodak Co.—What engineers and the Engineering Manpower Council can and must do to utilize trained men, attract young man into engineering and convince civilian and military authorities of the critical role engineers must play in war and peace.

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The new improved Flexipipe is efficient, serviceable and economical. It's made in a variety of diameters and lengths and with various accessories to take care of your individual requirements. Write us for complete information and sample.

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Companies Report Earnings

Clinchfield Coal Corp. and subsidiaries—6 mo to June 30, net income of $862,089, equal to $1.15 a share, on net sales of $14,478,898, compared with $884,384, or $1.18 a share, on sales of $11,969,917 for same period of 1950.

Pittston Co. and subsidiaries—6 mo net income, $506,460, equal to 83c a share, on operating revenues of $46,243,291, compared with $823,332, or $1.35 a share, on revenues of $36,543,147 last year.

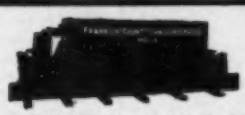
Glen Alden Coal Co. and subsidiaries—6 mo to June 30, net loss of $126,453 on net sales of $41,701,481, compared with a net profit of $1,287,888, or 74c a share, on sales of $43,367,612 in the first 6 mo of 1950.

Truax-Traer Coal Co. and subsidiaries—3 mo ending July 31, net profit of $151,053 after taxes, or 14c a share, on net sales of $12,512,706, compared with a net of $795,205, or 72c a share, on sales of $11,283,186 in the same quarter of 1950.

Peabody Coal Co. and subsidiaries—Quarter to July 31, net loss of $33,450 on net sales of $11,025,789, compared with net profit of $381,787, or 28c a share, on sales of $13,111,495 in the 1950 quarter.

MORE HAULAGE FOR 20% LESS BATTERY CAPACITY

Double knee-action; better reliability. Floating power; less power consumption. Quick acting footbrake—essential for quick stopping, especially behind loading machines. Brake shoes that follow wheels (due to knee-action). Adjustable Timken Bearings throughout.



Headlight transmission in any storage battery locomotive. Oil-tight: lashproof. Use only air auto oil; change every 6 months. Strong. Simple design. Low maintenance cost. Backed by over 25 years of experience with Greensburg Battery locomotives.

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Franklin County Coal Corporation at Royalton and Herrin, Illinois, have 12 of our Monitor type, storage battery locomotives.

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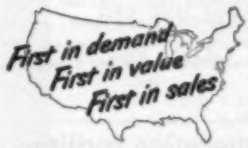

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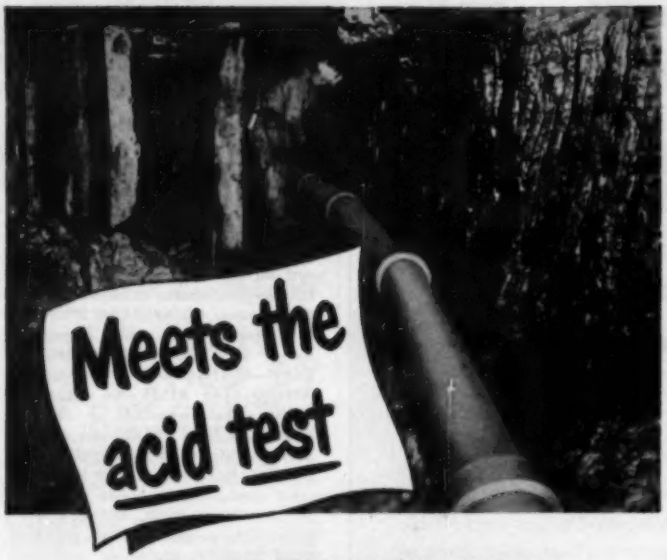

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Many installations of Transite Mine Service Pipe have passed the rugged test of carrying acid mine drainage waters for fifteen years or more.

In many cases the corrosive solutions that attacked this asbestos-cement pipe day in and day out were so aggressive that they had "knocked out" ordinary pipe in a few months!

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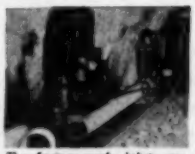
Available for working pressures up to 150 lbs. per sq. in. and in full range of diameters from 4" up, Transite is also the money-saving pipe for water supply lines, spray and return lines from condenser cooling towers, road culverts and fire prevention ducts for carrying sulphuric fumes and condensation. For further information, write for Brochure TR-51A. Address Johns-Manville, Box 290, New York 16, N.Y.



The factory-made joints are assembled with a simple coupling puller.

Curves can be negotiated with Transite Mine Service Pipe. Deflections up to 5° can be made at each joint.

Tough, strong asbestos fibres help give this pipe many of its outstanding qualities.

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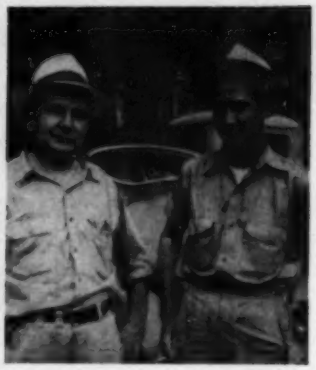
TRANSITE mine service PIPE

COAL MEN ON THE JOB



D. E. GRIFFITH (left), president, Pruden Coal & Coke Co., Pruden, Tenn.; and Ira Inman, Middlesboro, Ky., secretary and safety director, Cumberland Valley Mining Institute.

Preparation Facilities

Rhoads Contracting Co., Ashland, Pa.—Contract closed with Wilmot Engineering Co. for two Type D jigs for stove and nut coal; feed capacity, 50 tph.

Bethlehem Steel Co., Coke Dept., Johnstown, Pa.—Shipment by Deister Concentrator Co. of eight SuperDuty Diagonal-Deck No. 7 coal-washing tables.

Wise Coal & Coke Co., Dorchester, Va. — Shipment by Deister Concentrator Co. of five SuperDuty Diagonal-Deck No. 7 coal-washing tables.

Deal Coal & Sand Co., Ferrellsburg, W. Va.—Shipment by Deister Concentrator Co. of one SuperDuty Diagonal-Deck No. 7 coal-washing table.

Avon Coal Co., Ltd., Minto, N. B., Can.—Contract closed with Dominion Bridge Co., Ltd., for one Vissac Pulso drier, capacity, 30 to 50 tph of 1-inx0 coal from stripping operations; predrying before tippling of coal at from 6 to 12% surface moisture down to 3% in summer and 2% in winter.

Mohawk-Hillcrest Colliers, Ltd., Bellevue, Alta., Can.—Contract closed with Dominion Bridge Co., Ltd., for one Vissac Pulso drier, capacity, 80 tph of 1-inx0 from strip mines; predrying before air cleaning, with coal received at from 6 to 12% surface moisture and delivered at 1½%.

Brazeau Collieries, Ltd., Nordegg, Alta., Can.—Contract closed with Dominion Bridge Co., Ltd., for complete tipple, preparation and briquet plant; preparation plant to clean 150 tph of 4x0 and to include one pulsating jig for 4x½, one Feldspar jig for ½-

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because it takes *extra* dollars to keep a complete stock of different sizes of endless v-belts ... *extra* dollars to provide adequate storage space ... *extra* dollars to maintain an accurate inventory control ... and *extra* dollars in an inventory of belts that may deteriorate before they can be put into service.

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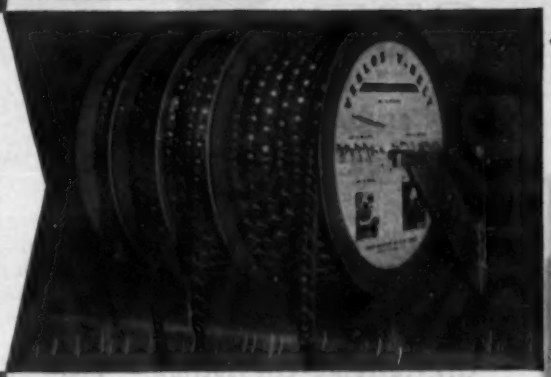
because these 4 reels of Veelos *adjustable* v-belt in the O, A, B and C widths will replace up to 316 sizes of endless v-belts. Veelos on reels is easy to store on the wall or floor ... easy to control, for a glance tells you stock on hand. And Veelos holds inventory investment dollars to a minimum while providing *the right size v-belt when you need it*—without delay, without deterioration.



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because Veelos *keeps* your machines producing. Profit-killing downtime for belt installation is practically eliminated. Veelos installs quickly —on some drives in less than one-tenth the time of endless v-belts because it is unnecessary to dismantle outboard bearings. Simple adjustment permits easy maintenance of uniform tension on all belts ... assures constant, vibrationless, full power delivery.

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You get extra-wide gathering range—5" axial displacement or 60° angularity, *horizontally;* 2⅞" displacement or 18° angularity, *vertically.* Locks grip tightly—prevent slack and costly wear. You can rotary-dump *without* uncoupling; unlock from either side. Get the utmost in safety and savings now! *Standardize on* American Automatic Mine Car Couplers.

ALWAYS READY TO COUPLE

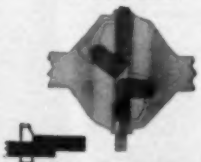
Any two heads couple —and they're always ready to couple, because locks pivot freely in uncoupled heads. Movement of lock-control bar remains unrestricted until flanges of two heads come together.

HOW AMERICAN COUPLERS LOCK

WON'T "CREEP"

As pivoted locks swing into engagement, each control bar drops to lock against the flange of opposite head.

LOCK-SET FOR UNCOUPLING



Lifting and pulling either control bar unlocks the coupler and holds lock in lock-set position until heads move apart.

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New Books for Coal Men

Finding Spare Shovel Parts

Shovel Electrical Spares, by a committee of the Electrical Div., Open Pit Mining Association. If you have an electrical breakdown in your heavy pit equipment, here's a list of big electrical spare parts owned by mining companies and stocked in manufacturers' and suppliers' warehouses. Only large revolving electrical spares are listed but if other parts are needed, the directory will help you find who is most likely to have what you need. Once you locate what you need, it's up to you to make the deal. *One copy free to Electric Division members; additional copies, $3 each. L. E. Briscoe, Sec.-Treas., Care Ayrshire Collieries Corp., Indianapolis, Ind.*

Competing-Fuel Costs

Comparative Costs of Competitive Fuels, by L. W. McCloud. This is a statistical study of fuel consumption resulting from cooperation among federal agencies, fuel-industry associations, various industrial companies and staff members of West Virginia University. It includes data on fuel and electric energy consumed by manufacturing industries for heat and power. *89 pp., 8½x11-in; paper. No price quoted. Bureau of Business Research, Dept. of Economics and Business Administration, West Virginia University, Morgantown.*

Mining Electricity

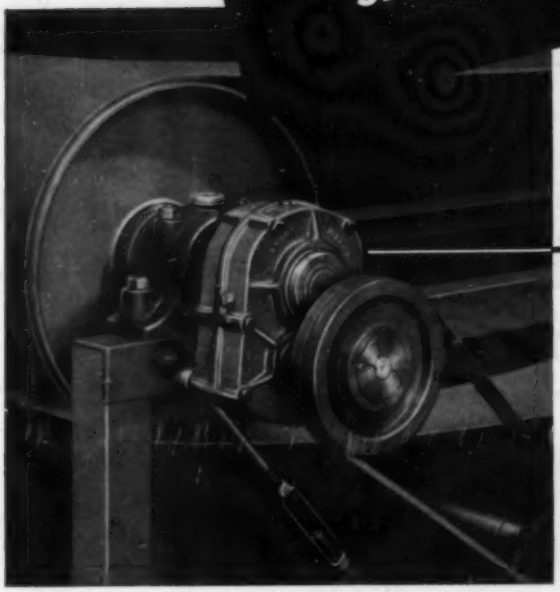
Mechanized Mining Electrical Applications, by D. C. Jones, director, and M. E. Altimus, Jr., assistant supervisor of mining extension, Mineral Industries Extension Services, Pennsylvania State College, is a text for mine employees and supervisors who wish to upgrade themselves by increasing their knowledge of the fundamentals of electricity and the application of electrical power to mining tasks. The recently revised book also includes trouble-shooting hints for the practical man. 445 pp. *Mineral Industries Extension Services, Pennsylvania State College, State College, Pa.*

Other Books and Booklets

The following publications by the Bureau of Mines are available free upon request to Publications Distribution Section, 4800 Forbes St., Pittsburgh 13, Pa. All are 8x10½-in; mimeo; paper.

Froth-Flotation Practice in Coal-Preparation Plants of Western Europe and Great Britain, by B. W. Gandrud,

THE SPEED REDUCER THAT SAVES YOU MONEY!



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Thomas Fraser and H. F. Yancey. I. C. 7614. 17 pp.

Roof Bolting and Dust Control, by James Westfield, F. G. Anderson, C. W. Owings, J. P. Harmon and Leslie Johnson. I. C. 7615. 8 pp.

Anthracite Mechanical Mining Investigations, Progress Report 4: Status of Bureau of Mines Underground Experimental Work With Lightweight Shearing Machines in Pitching Anthracite Beds, by J. W. Buch, Andrew Allan, Jr., and R. S. Davies. R I. 4798. 11 pp.

Estimate of Known Recoverable Reserves of Coking Coal in Armstrong County, Pa., by J. J. Dowd, A. L. Toenges, R. F. Abernethy, D. A. Reynolds and L. A. Turnbull. R. I. 4801.

A Survey on the Hydraulic Transportation of Coal, by R. W. Dougherty. R. I. 4799. 22 pp.

Size of Smallest Particles Determined in Impinger Dust-Counting Methods, by C. E. Brown, Morris Fisher and F. F. Boyer. R. I. 4802. 19 pp.

Estimate of Known Recoverable Reserves of Coking Coal in Westmoreland County, Pa, by J. J. Dowd, L. A. Turnbull, A. L. Toenges, R. F. Abernethy and D. A. Reynolds. R. I. 4803. 16 pp.

Estimate of Known Recoverable Reserves of Coking Coal in Fayette County, Pa., by J. J. Dowd, L. A. Turnbull, A. L. Toenges, R. F. Abernethy and D. A. Reynolds. R. I. 4807. 19 pp.

Bench-Scale Studies of the Fischer-Tropsch Synthesis Over Iron, Nickel and Nickel-Cobalt Catalyst (Japan), by Shiro Watanabe and R. C. Grass. USBM, I. C. 7611.

Report of Research and Technologic Work on Explosives, Explosions and Flames, Fiscal Year 1950, by Bernard Lewis. USBM, R. I. 4793. 67 pp.

The Combustion Characteristics and Physical Properties of Packaged Fuels Containing Bituminous Coal, by J. W. Myers and R. G. Corey. USBM, R. I. 4797. 30 pp.

Methods of Reducing Dust Emission From a Spreader-Stoker-Fired Boiler Furnace by W. C. Holton and R. B. Engdahl. More about over-fire jets for industrial boilers. 9 pp. 8½x11-in; paper. 20c, Bituminous Coal Research, Inc., 2609 First National Bank Building, Pittsburgh 22, Pa.

Investigation of a Photoelectric Device for the Determination of Low Concentrations of Dust. Office of Technical Services, Dept. of Commerce, PB 103 260. 13 pp. Microfilm, $1.75; photostat, $2.50; Library of Congress Photoduplication Service, Publication Board Project, Washington 25, D. C. Also available free as USBM, R. I. 4782, Publications Distribution Section, 4800 Forbes St., Pittsburgh 13, Pa.

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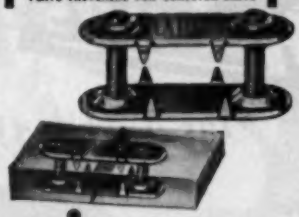
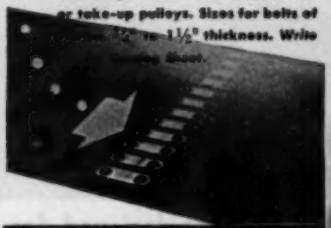


Make strong dust-tight, water-tight joints in belts of any width. Special design spreads tension uniformly across belt, allow natural troughing of belt and assures smooth operation over flat, crowned or take-up pulleys. Sizes for belts of ½" to 1½" thickness. Write [illegible] Sheet.



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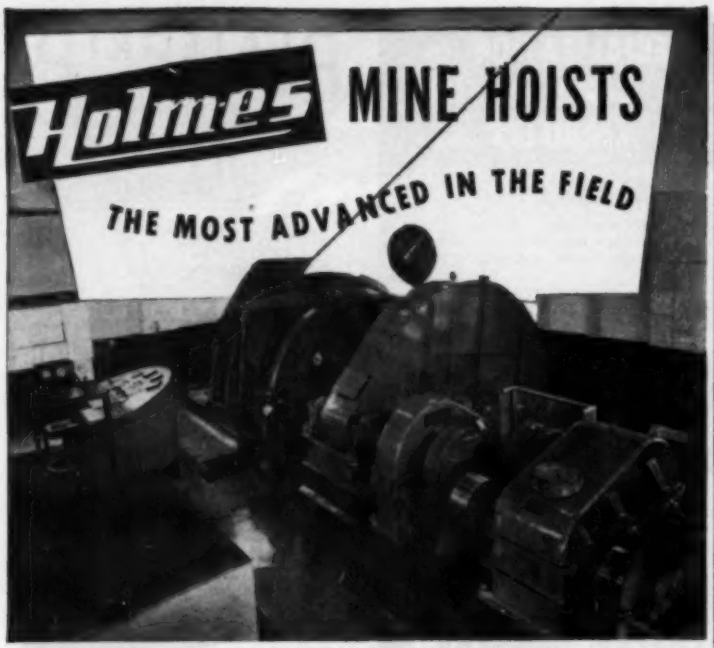

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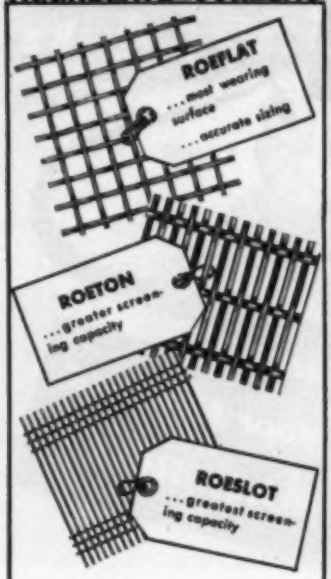

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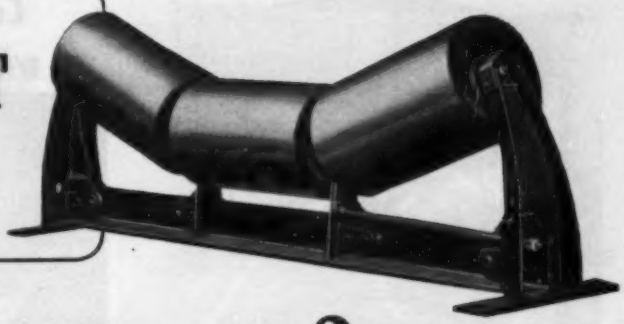

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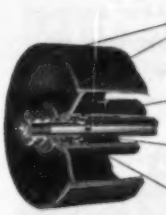

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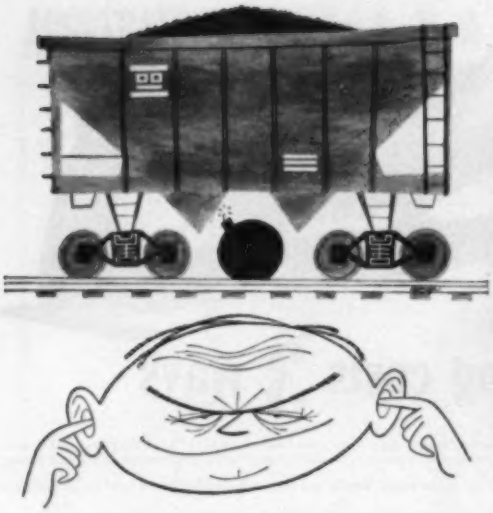

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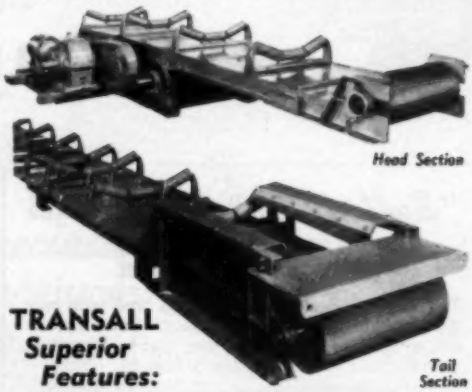

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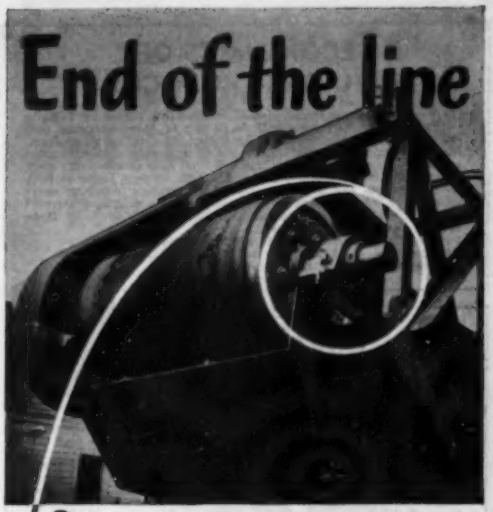

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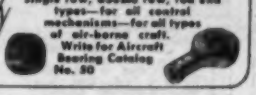

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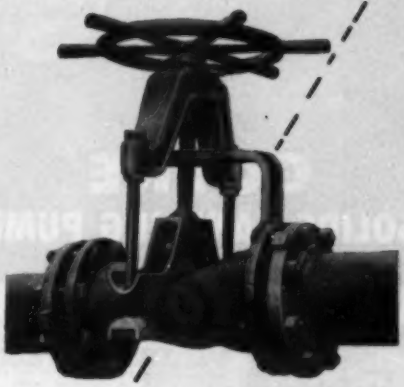

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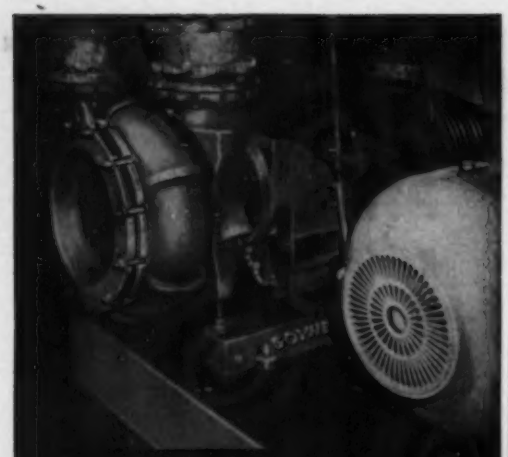

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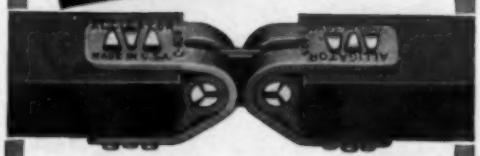

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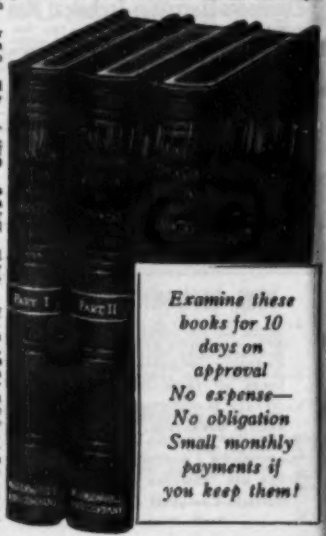

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Send me, charges prepaid, Beard's Mine Examination Questions and Answers, 3 volumes, for 10 days' examination. If satisfactory I will pay $9.50 at the rate of $3.50 in ten days and $3.00 per month. If not wanted I will return the three volumes postpaid.

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Coal Mine 100 Acres West Virginia Drift mine; fully equipped including 20 new mine cars; 3 bldgs.; additional acreage; some strip coal; fine for small or large operation; Low Price; Apple Co., Brokers, Cleveland Ohio.

WANTED!!! SALES ENGINEER

Excellent opportunity with leading manufacturer of mining and quarrying machinery for aggressive man with experience in vibrating screen sales work in coal or metal mining or quarrying fields. Please give experience, education and background in first letter. Replies kept confidential.

BW 1935 COAL AGE
330 N. Michigan Ave., Chicago 11, Ill.

Engineers-Executives-Technical Men

Salaried Position, $4,000 to $30,000. This Confidential service for men who desire a new connection, will develop and conduct preliminary negotiations without risk to present position. Send name and address for details.

TOMSETT ASSOCIATES
339 Frick Bldg. Pittsburgh 19, Pa.

WANTED

150—All Steel End Dump Mine Cars, 44" track gauge, 40" wheel base, Maximum dimensions: height above rail 36", overall width 6'-6", overall length 12'-0".

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MINE EQUIPMENT FOR SALE

3—250 KW RIDGWAY M. G. SETS, 600 RPM., 275 VOLTS, DC. 2300 VOLTS, AC. TWO EQUIPPED WITH AUTOMATIC RECLOSING DC CIRCUIT BREAKERS—ONE FULLY AUTOMATIC, TWO MANUALLY OPERATED.
2—JEFFREY L-400 LOADING MACHINES. 275 VOLTS. 44" TRACK GAUGE. NOW IN OPERATION.
2—JEFFREY 39-C CUTTING MACHINES. 8 FT. UNDERCUT. 275 VOLTS. 44" TRACK GAUGE. NOW IN OPERATION.
1—AMERICAN SAW MILL, MODEL 3, COMPLETE —NEVER USED.
1—BRODERICK & BASCOM AERIAL TRAMWAY, 1800 FT., 2—45 CU. FT. BUCKETS, 500 FT. PER MIN., POWERED BY 40 HP MOTOR.

Hatfield-Campbell Creek Coal Co.
Reed, West Virginia

One (1) 1204' x 30" type 52-B
BELT CONVEYOR
new, without belt.

SMOKELESS COAL CO.
P. O. Box 508 Clarksville, Arkansas

FOR SALE
3 Wing Motorized Blowers
36" diam. Capacity 19200 C.F.M. at 3" S.P. and net 17000 C.F.M. at 4" S.P. The units are equipped with 20 H.P. 3 Phase, 220-440 volts, 60 cycle, 1750 R.P.M. motors.

TUBULAR PRODUCTS, INC.
Souderton, Penna.

MOTOR GENERATORS

2—300 KW G.E. Syn. 275 V. 1200 RPM
1—300 KW WEST. Syn. 275 V., 1200 RPM
1—200 KW G.E. Syn. 275 V. 1200 RPM
1—200 KW G.E. Syn. 575 V. 1200 RPM
2—150 KW G.E. Syn. 275 V. 1200 RPM
1—100 KW G.E. Syn. 275 V. 900 RPM

ROTARY CONVERTERS

1—500 KW G.E. Syn. 275 V. 1200 RPM HCC, 6 Ph., 60 Cy. Transformers
1—300 KW G.E. Syn. 275 V. 1200 RPM HCC 6 Ph., 60 Cy. Transformers
1—300 KW WEST. Syn. 275 V. 1200 RPM 6 Ph., 60 Cy. Transformers
1—200 KW WEST. Syn. 275 V. 1200 RPM 6 Ph., 60 Cy. Transformers
1—150 KW G.E. Syn. 275 V. 1200 RPM HCC, 6 Ph., 60 Cy. Transformers
1—150 KW WEST. Syn. 275 V. 1200 RPM 6 Ph., 60 Cy. Transformers

ARMATURES

1—300 KW G.E. 275 V. MPC Gen. 900 RPM

LOCOMOTIVES

2—30 T JEFFREY 250 V. MH-77 48-36" Ga.
1—25 T G.E. 500/250 V. HM-824-A 44-36" Ga.
1—22 T WEST. 250 V. ML-929-C 42-36" Ga.
1—20 T JEFFREY 250 V. MH-77 48-36" Ga.
1—20 T G.E. 250 V. (tandem) HM-809 36" Ga.
1—10 T JEFFREY 250 V. MH-2110 48-36" Ga.
2—10 T JEFFREY 250 V. MH-110 44-36" Ga.
1—10 T WEST. 250 V. ML-907-C 36" Ga.
2—10 T GOODMAN 250 V. 36-B 36" Ga.
2—9 T JEFFREY 250 V. MH-100 42-36" Ga.
1—9 T WEST. 250 V. ML-906-C 44-36" Ga.
2—6 T JEFFREY 250 V. MH-88 44-36" Ga.
2—4 T GOODMAN 250 V. MS-4-E 36-24" Ga.

LOCOMOTIVE MOTORS

2—JEFFREY 250 V. MH-77, Ball Bearing
2—WEST. 250 V. ML-908-C, Ball Bearing
2—WEST. 250 V. ML-904-R, Ball Bearing
2—WEST. 250 V. ML-901-C, Ball Bearing
2—G.E. 500/250 V. HM-824-A, Ball Bearing
2—G.E. 85/125 V. HM-828-A, Ball Bearing
4—WEST. 80 V. V-49-X, Ball Bearing

Extra Armatures Available for above motors.

WALLACE E. KIRK COMPANY
501 GRANT BUILDING PITTSBURGH 19, PENNSYLVANIA

INTERNATIONAL TD 18
with hydraulically controlled 12 Ft. Bucyrus-Erie Angledozer. Suitable for coal stripping and other heavy work. Machine shop overhauled and rebuilt like new. Price $5950.00.

O. C. EVANS
Phone 195 Mt. Sterling, Kentucky

FOR SALE
Coal Briquetting Plant, 30 tons per hour capacity. Complete plant in every respect, in good condition. For more detailed information write—

NATIONAL ENGINEERING CO.
Fort Scott, Kansas

FOR SALE

Fully equipped modern operating Coal Mine with Washer
Formerly Consolidated Coal Co. Mine #7
Staunton, Illinois
Approx. 5,000,000 tons excellent grade coal reserve
7 Ft. seam — Capacity 1800-2000 ton daily single shift
Very good top conditions
Excellent truck trade

WRITE OR WIRE
BO 1965, COAL AGE
520 North Michigan Ave., Chicago 11, Ill.

FOR SALE

MOTOR GENERATOR SETS

1—100KW General Electric synchronous Motor Generator Set, AC end 138 HP, 2300 volts, type TS, 1200 RPM. Direct connected to type CD, 100KW, 1200 RPM, 250 volts DC generator, complete with switchboard.
1—75KW Westinghouse Motor Generator Set, 250 volts DC, 220 volts AC, complete with switchboard.

MINING MACHINES

7—512 EJH Goodman DC shortwall mining machines, complete with bug dusters, hydraulic control, 8½' cutter bars, cables, and Joy T1 cat trucks. Serial Nos. 8909, 8910, 8911, 8864, 8865, 8934, 8935 (Like new)
2—512-DG3A Goodman shortwall mining machines, AC, 8½' cutter bars, complete with cable. Without trucks.
2—512-EL3 Goodman shortwall mining machines, AC, 7' cutter bars, complete with Joy T1-4G cat trucks and cables.
5—112AA Goodman Universal shortwall mining machines, AC, without trucks.
1—12AA Goodman standard shortwall mining machines, DC, with trucks.
8—Sullivan CLE5 longwall mining machines, 3/60/220 volts, with 4½' cutter bars.
1—112AA Goodman Universal DC shortwall mining machine. (With trucks.)
2—12AA Goodman AC, 50 HP, standard shortwall mining machines. (With or Without trucks)

CRUSHERS

1—36 x 36 Jeffrey single roll crusher.
1—36 x 40 Link Belt double roll crusher.
1—24 x 48 McNally Pittsburgh double roll crusher.
1—30 x 36 United Iron Works single roll crusher.
1—24 x 24 Hercules single roll crusher.
1—24 x 24 Webster single roll crusher.
1—24 x 24 Stephens Adamson single roll crusher.
1—18 x 18 Jeffrey single roll crusher.
1—12 x 16 Eagle Iron Works double roll chipper, complete with hopper and 7-½ HP AC motor. (Mounted on one base. Like new.)
1—48" McNally Pittsburgh Vertical Pick Breaker.
2—American Pulverizer Company Ring Ball crushers.

COPPER

Several thousand feet of #6, 3/C, 5,000 volts, lead covered armored cable.
Several thousand feet of 750,000 and 1,000,000 CM, bare and weatherproof, stranded copper wire, in long lengths.

LOCOMOTIVES (Ball Bearing)

Make	Type	Gauge
1—15 ton Jeffrey	MH110	42"
3—6 ton Goodman	82AO4T	36"
1—6 ton Goodman	82AO4T	42"
1—4 ton Goodman	42-I-4-T	36"
6—6 ton G. E.	HM82BA	42"
1—6 ton G. E.	HM72BB	42"
1—6 ton Jeffrey	MH64	42"
1—8 ton Westinghouse	4-2-55-C-427	36"

DRILLS

Several Chicago Pneumatic, 472 and 475, AC and DC drills.

PIT CAR TRUCKS

150 sets—42" gauge, 14" diameter, Sanford Day Timken bearing pit car trucks.

HOPPER CARS

28—15 ton Sanford Day automatic drop bottom cars with multiple latch arch bar truck, 4 wheels under each end, 18" wheels, 36" gauge, Sanford Day roller bearing trucks. Overall dimensions: Overall length over bumpers 29'3"; Overall length inside 29'11⅛"; Overall width 6'10⅝"; Overall height 6'6". Size of door: Width 2'9". Length both doors 11'9⅛".

CONVEYORS

1—Jeffrey Apron Conveyor, 48" wide and approximately 57' long.
1—Webster Apron type Feeder, 54" wide and 11' long.
2—Godfrey 12" Stationary Flight Conveyors, two being 24' long and one 30' long. Each complete with motor.

DUCKBILL UNITS

10—G20 AC Goodman duckbill units complete.
2—G20 DC Goodman duckbill units complete.

RAILS

Approximately 100 tons used 16# rails, random lengths.
Several hundred tons of 56# and 60# relaying rails, long lengths.
Several hundred tons of rails, 56# and up, suitable for roof bars, random lengths from 6½' and up.
We carry splices, angle bars, track bolts, and track spikes in stock.

VIBRATORS

1—48" x 102", style C-700, Robbins Gyrex double deck.
1—Stephens Adamson two deck vibrator, size 4' x 10'.
1—Robbins Vibrex vibrator, single deck, size 2' x 4'.

JOY LOADERS

6—8BU DC Joy Loaders.

We also carry a complete line of conveyors of all sizes, together with fans, feeders, hoists, electric motors both AC and DC, speed reducers, transformers, etc.
We appreciate your inquiries.

GAVENDA BROTHERS, Inc.
CANTON, ILLINOIS

MINE AND SLOPE HOISTS

1—30,000# Allis-Chalmers, Dbl Drum
1—25,000# Nordberg Sgl Drum
1—25,000# Vulcan Sgl Drum AC with MG Set Complete
1—11,500# Wellman, Sgl Drum AC
1—10,000# Allis-Chalmers Sgl Drum
1— 7,000# Ottumwa Sgl Drum AC

CARPULLERS AND LOADERS

1—5000# Jeffrey Carpuller AC
1—5000# Brownie Carpuller AC
1—5000# Link-Belt Carpuller AC
1—20,000# Ameer, Model Carpuller AC
1—20,000# LB Endless Puller

CRUSHERS & MISC.

1—36x36 Jeffrey Sgl Roll
1—12x16 Eagle Dbl Roll
1—18x20 Eagle Dbl Roll
1—420 ft. x 20" SA Comb. Scraper & Basket Conveyor w/o MT'r. Ideal for tipple or dock.
2—24"x80' SA parts, conveyors, AC MT'r
1—(New) NOLAN Parts Loader
1—22"x20" SD-RS Roots Connersville Positive Pres. Blower output 41 CF per. Rev. Complete with 100 hp. AC MT'r and controls.
1—3 yd. Sauerman Scraper Bucket System
1—75' x 28' x 30' high Steel Building

154 So. Michigan Ave., Chicago 3, Ill.

HAWKINS & CO.
TELEPHONE HARRISON 7-0725

COAL CUTTER: Goodman 212G3, low vein.

LOCOMOTIVE: Goodman 3304T Haulage, 6 ton, 250 volt, 36" Gauge.

Guaranteed rebuilt, attractive price.

Also Coal Crushers, Conveyors of all types, Electric Motors, etc.

The Industrial Equipment Corp.
910 First National Bank Bldg.
Pittsburgh 22, Pa. Atlantic 1-2929

HOISTS

1—#21½ Vulcan Single Drum, direct geared to a U-6 International Gas Power Unit
1—#6½ Vulcan, single drum
1—Box Iron Wks. Single Drum, direct geared to a 15 HP Slip-ring Motor
1—H6S Single Drum Converted, direct geared to a 25 HP Slip-ring Motor
1—Crow Converted Single Drum Friction, direct geared to a 7½ HP Slip-ring Motor

LOCOMOTIVES

2—7½ Ton Goodman Trolley Locos. 36" ga.
1—4½ Ton Goodman Trolley Loco. 36" ga.

PIT CARS

150 Card RB Pit Cars, 36" ga. 1.7 ton cap.
6—Card RB Pit Cars, 36" ga. 1 ton cap.

COAL CRUSHERS

1—24 x 24 Jeffrey Single Roll, with steel hopper
1—36" American Ring Type Crusher

MISCELLANEOUS

1—CE-7 Sullivan AC Coal Cutter
1—3200' Aerial Tramway
1—750' Jig-back Tram
1—Jeffrey Blower Fan with 1½ HP Enclosed AC Motor
1—Stromberg Metal Mine Phone — Wall telephones
1—Manierre Type Box Car Loader, 12' center, 18" belt
1—Sullivan LW-6 Wagon Drill
1—22,500 gal. Wood Stave Water Tank
2—500 gal. Fuel Oil Tanks
1—5.72 New Speed Reducer, 5-1 Ratio
1—Rock Duster on 36" ga. trucks
Bucket Elevators
Revolving Screens
Motors — ¼ HP to 50 HP

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Suite 904, Equitable Bldg. C. J. Parrish, Mgr. Denver 2, Colo.

FOR SALE
WIRE ROPE

2—1,250 Ft. Pcs. 1-⅝" Roebling Locked Smooth Coil Track Strand Wire Rope for Aerial Tramway. NEW—NEVER USED. Apply to THE SNAP CREEK COAL COMPANY, P.O. Box No. 1029, or Tel. 1533, Logan, West Virginia.

SUBSTATIONS—AC to DC
Switchboards & Control Apparatus Tailored for Your Job
MOTORS — TRANSFORMERS
C. B. LOCKE CO.
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CARLYLE
INDUSTRIAL RUBBER PRODUCTS FOR EVERY PURPOSE

IMMEDIATE DELIVERY OF CONVEYOR, ELEVATOR AND TRANSMISSION BELTING — PIPE, WATER, SUCTION, AIR, STEAM AND WELDING HOSE

WHY WAIT

We have 8 to 48

RUBBER CONVEYOR BELTING

TOUGH COVERS—Heavy duty, specially compounded abrasive resistant rubber covers having high tensile strength. Thoroughly capable of withstanding the abrasive action of bulk materials. Properly vulcanized to the carcass to assure utmost performance, economically.

STRONG CARCASS—Constructed of finest quality 28 and 32 ounce tough cotton duck, properly treated and impregnated to avoid mildew from moisture and atmospheric conditions. Each ply thoroughly embedded in rubber to prevent ply separation.

FLEXIBILITY — Careful attention has been given in the construction of all belts to have the proper flexibility assuring the following desirable features: troughs easily, runs true on all idlers, gouge resistant, excellent for long and short hauls and slope installations.

Avoid delays in your production schedules!

We carry in stock for your immediate requirements, Conveyor Belting in widths from 8 inches to 48 inches.

Width	Ply	Thickness Top Cover	Thickness Bottom Cover	Type of Duck Carcass
8"	4	1/16"	1/32"	28 Oz.
10"	4	1/16"	1/32"	28 Oz.
12"	4	1/16"	1/32"	28 Oz.
14"	4	1/16"	1/32"	28 Oz.
16"	4	1/8"	1/32"	28 Oz.
18"	4	1/8"	1/32"	28 Oz.
20"	4	1/8"	1/32"	28 Oz.
20"	5	1/8"	1/32"	28 Oz.
24"	4	1/8"	1/32"	28 Oz.
24"	5	1/8"	1/32"	28 Oz.
26"	5	1/8"	1/32"	28 Oz.
30"	4	1/8"	1/16"	32 Oz.
30"	5	1/8"	1/16"	32 Oz.
30"	6	1/8"	1/16"	32 Oz.
36"	6	1/8"	1/16"	32 Oz.
42"	5	1/8"	1/16"	32 Oz.
48"	6	1/8"	1/16"	32 Oz.

INQUIRE FOR SIZES NOT LISTED. ELEVATOR TRANSMISSION & V-BELTING ALSO IN STOCK.

All our belting made by the leading belting manufacturers.

Write for Free Booklet on Installation, Care & Maintenance of Conveyor Belting.

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62-66 Park Place, New York 7, N. Y.
Phone: Digby 9-3810

REBUILT ELECTRICAL MACHINERY

MOTOR GENERATOR SETS

1250 KW G.E. 275 v. 720R-MCF-ATI 2300
750 KW Al.Ch. 250 v. 720R-Syn. 440
400 KW West., 550 v. 720R-Syn.-SK 2300/4000
300 KW G.E. 275 v. 1200R-MPC-ATI 2300/4000
300 KW Ridg. 275 v. 1200R-Syn. 2300
300 KW West. 550 v., 1200R-Syn.-SK 2300
200 KW West. 275 v. 1200R-SK-CW 2300
200 KW Ridg. 275 v. 900R-Syn. 2300
200 KW G.E., 550 v. 1200R-MPC-ATI 2300
200 KW G.E. 275 v. 1200R-MPC-ATI 2300/4000
150 KW West. 275 v. 1200R-Syn.-SK 2300
150 KW G.E. 550 v. 900R-DLC-ATI 2300
100 KW Ridg. 275 v. 1200R-Syn. 2300

ROTARY CONVERTERS

500 KW G.E. 275 V. HCC6-1200 R. 2200/4000
300 KW G.E. 275 V. HCC6-1200 R. 2200/4000
300 KW West. 275 V. 1200 R. 2200/4000
300 KW G.E. 275 V. HC12-600 R. 2200/4000
150 KW West. 275 V., 1200 R. 2200/4000

PORTABLE AIR COMPRESSORS

2—142 CFM 100# pres. Ingersoll Rand Model 25-B. Late Type. 30 HP 230 V. DC

AC MOTORS

HP	MAKE	SPEED	TYPE	WDG.
400	G.E.	450	MT	S.R.
300	G.E.	450	IM	S.R.
200	G.E.	600	IK	S.C.
150	G.E.	600	ATI	Syn.
2—160	G.E.	450	IM	S.R.
100	Al.-Ch.	720	ARX	S.C.
100	West.	900		Syn.
100	West.	1200	CS	S.C.
75	G.E.	600	ITC	S.R.
75	West.	900	CS	S.C.
40	G.E.	900	MT	S.R.

LOCOMOTIVES AND CUTTING MACHINES

10 Ton Jeff 250 v. 36/42" MH110
8 Ton Goodman 250 v. 44/428" Ga. 9104C2
8 Ton Goodman 500 v. 44/42" Ga. 9104C2
2—8 Ton Jeff. 250 v. 42" MH100
6 Ton Westgh. 250 v. 36" Ga. 904
6 Ton G.E. Battery 42/44" Ga.
4—5 Ton Goodman 30B 250 v. 42/44"
38 B Jeff. 250 v. Permissible
12 G3 Goodman Smartwall 220/3/60

MOORHEAD ELECTRICAL MACHINERY CO.

(Est. 1919)
363 Noblestown Road, Oakdale, Pa. Pittsburgh District Pittsburgh Tel. WAlnut 1-4300

LOCOMOTIVES

4—30 ton Mechanical Driven Diesel Locomotives, standard gage and equipment
1—12 ton Diesel Narrow Gage Locomotive
1—10 ton Jeffrey Electric with MH110 motors
1—8 ton Jeffrey with MH100 motors
1—6 ton Jeffrey with MH88 motors
1—4 ton Jeffrey with MH96 motors

COAL CUTTING MACHINES

4—29LE Jeffrey turn over head, track mounted
4—35B Shortwall Loading Machines
3—14BU's, 1—8BU, 2—12BU's, 1—11BU Joy Loading Machines
1—D6 Caterpillar Angle Dozer

TIPPINS MACHINERY CO.

Pittsburgh 6, Penna.

Goodman Mineral A.C. & D.C. Machines Completely Rebuilt on Tip Turn or Cats Trucks A.C. & D.C.
4—512 E.L. 3 Cuttings Machines 50 H.P. 7½ ft. Cutter Bar on Joy Cats A.C. & D.C.
1—Goodman Loading Machine 42 inch Gauge Type 360 D A.C. 220 Volts
2—Goodman Track Cutting Machines 36 or 42 inch Gauge
3—13 Ton G.E. Haulage Motors 42 Inch Gauge
5—11 B.U. Joy A.C. 220 Volts
5—11 B.U. Joy D.C. 250 Volts
10—8 B.U. Joys Loading Machines 250 Volts D.C. & 220 Volts A.C.
10—Joy Type 42 E Cable Reels Cars 250 Volts DC.
13—Joy Shuttle Cars with Battery Type 42 D. —14 P
10—6 Ton G.E. Locomotives 42 Inch Gauge
2—T-2 Joy Cats Trucks Low Vein A.C. 220 Volts
6—T-1 Joy Cats Trucks 220 Volts A.C.

THOMAS GILLESPIE & SON

STATE ROAD 67 BICKNELL, IND.
Phones 179 and 149-K

2—Goodman Style G20B77 permissible Shaker Conveyors, latest type, with manual type HAD duckbill and 20 HP Westinghouse AC motor, 3 phase, 60 cycle, 220 volt, 1160 RPM.

The above equipment is to include all usual accessories and is guaranteed to be in A-1 condition. New in 1943. It is offered subject to prior sale, f.o.b. Sunnyside, Utah.

KAISER STEEL CORPORATION
Sunnyside Mine
Sunnyside, Utah

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CONTRACTORS EQUIPMENT

1 9W Monighon Dragline
3 1201 Lima Draglines & Shovels
1 79 Lorain Shovel
1 855 P&H Shovel
2 D8 Caterpillar Tractors
2 D6 Caterpillar Tractors
2 Hardsocg Horizontal Drills
1 Buda Vertical Drill
13 27FDT Euclid Haulers
4 Hoff Track Trucks
9 Service Trucks & Pickups
1 10 Ton, 3 Wheel Roller
1 160 ft. Air Compressor

Your Inquiries Solicited

TERTELING BROS., INC.
Box 631, Zanesville, Ohio

NEW Allis-Chalmers MOTORS
50% Discount

5 to 15 hp, 1150 & 1750 rpm., Type AR ball bearing, 220/440 volt, 3 ph, 60 cy. (in original crates).

ROTARY CONVERTERS

150 to 1000 KW, complete to meet AC-DC requirements.

R. H. BENNEY EQUIPMENT CO.
5524 Montgomery Road, Cincinnati 12, Ohio
Phone: Melrose 1108

AIR COMPRESSORS

SULLIVAN WL-60 200 CFM
10 x 5-¾ x 5 AIR COOLED
40 HP GE DC 230V. CDM1129
DRIP PR. BB 850 RPM DIR. DR.
DIMEN. 37" x 75" x 40" HIGH
AUTO. ENC. STARTERS CR4065C1
EXCELLENT COND. Less ½ Price.

SAMUEL M. DAVIS

510 Lasalle St. St. Louis 4, Mo.

FOR SALE

New Axial Flow Fans
Capacities 3000 to 16000 CFM
3 Phase, 440 Volts, 60 Cycle with Starters
Rugged Construction
Acid Resisting Vanes
Explosion & Waterproof Motors, 2 Speed
For Horizontal or Vertical Installations
Also New 35000 CFM, 230 Volt DC Axial Flow Fans

Eastern Scrap & Salvage Corp.
65 Muirhead Ave., Trenton, N. J.
Telephone: 586349

BARGAINS FOR SALE OR RENT

100 KW. Diesel Engine Generator Sets

3—100 kw., 250/275 V. D.C. Delco Generators dir. con. to 150 HP. GBD-8, 5½x7, 8 cyl. Superior DIESEL Engines. Elec. starting, power panels and accessories.

1—100 kw., same as above with 220/440 V. New A.C. Generators.

MG Sets 250/275 V. D.C.

KW	Make	RPM	Volts	Type
200	Westg.	1200	2300/4100	Ac Ind.
200	Westg.	1200	220/440	AC Syn.
150	Burke	900	2300	AC Syn.
100	Westg.	900	2300	AC Syn.
100	Delco	1200	220/440	AC Syn.

250 volt D.C. GENERATORS

KW.	Make	rpm	type
500	Cr. Wh.	375	CCM
375	West	400	SK
250	new Allis Chal	2200	EBL
150	Burke	900	B-70
100	Delco	1200	—
100	West	2100	SK
75	West	750	—
60	West	1150	—SK-153

250 volt D.C. MOTORS

hp	Make	rpm	type
600	Cr. Wh.	300/330	ccm
400	West	300	
250	Allis Chal.	1750	splash proof
120	G.E.	300/750	DMC
100	West	1700	SK
60	West	850	SK-153
60	West	1750	SK-123L
50	Crock. Wheeler	700	CCM

Write for New Catalog

DUQUESNE ELECTRIC & MFG. CO.
PITTSBURGH 6, PA.

MODERNIZE WITH BONDED EQUIPMENT

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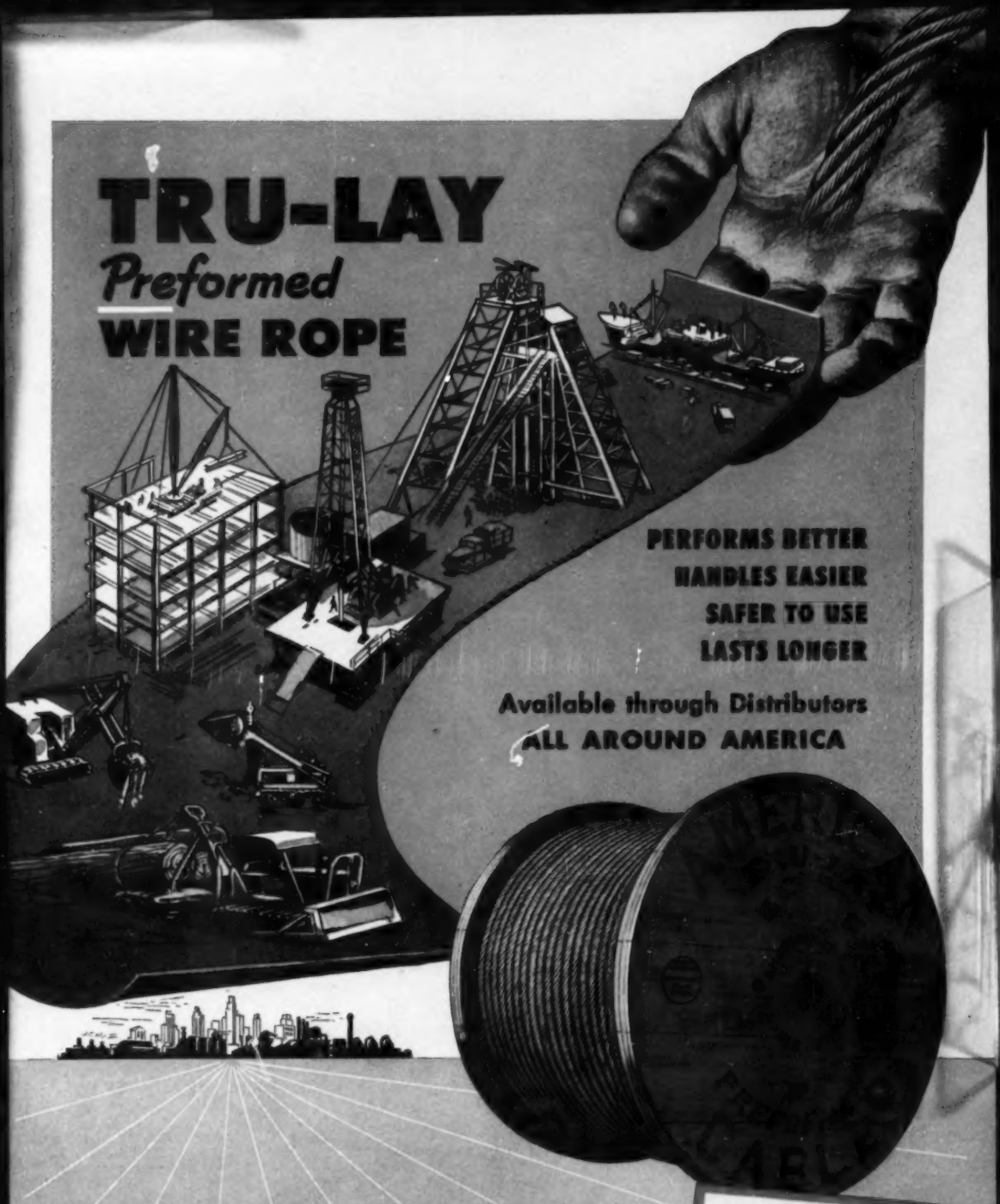

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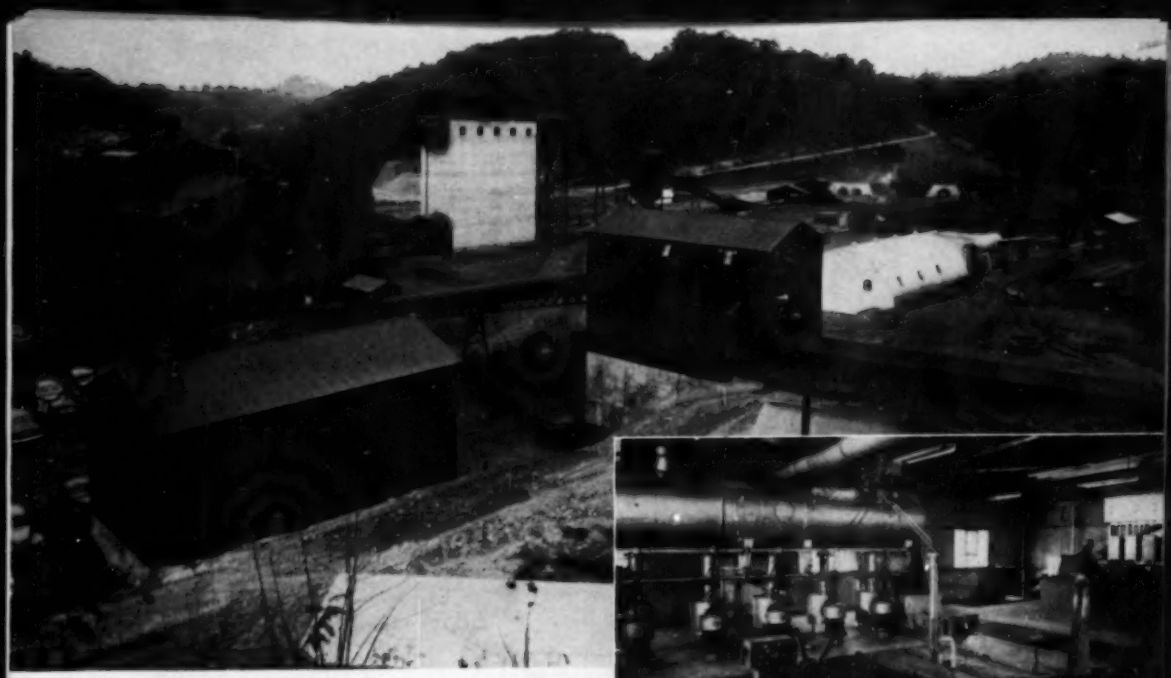

National gets flexible, high-capacity cleaning with their two Link-Belt Air-Pulsated Washers (right). Compressed air allows graduated pulsations in different compartments—immediate removal of heavy refuse . . . sharp separation of lighter refuse.

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Result: National loads 216 tons of 4" x 0" clean, uniform coal per hour . . . at the lowest possible over-all cost per ton. From mine car dumping to rail and barge loading, their Link-Belt equipment gives efficient, trouble-free service.

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